THE AUSTRALIAN NAVAL ARCHITECT

Volume 19 Number 3
August 2015

NUSHIP *Adelaide* rounding Bradleys Head on her first visit to Sydney on 26 June 2015
(RAN photograph)

THE AUSTRALIAN NAVAL ARCHITECT

Journal of
The Royal Institution of Naval Architects
(Australian Division)

Volume 19 Number 3
August 2015

Cover Photo:

The 39 m passenger ferry *Kilamanjaro V*, recently completed by Richardson Devine Marine Constructions in Tasmania for Azam Marine of Tanzania
(Photo courtesy Incat Crowther)

The Australian Naval Architect is published four times per year. All correspondence and advertising copy should be sent to:

The Editor
The Australian Naval Architect
c/o RINA
PO Box No. 462
Jamison Centre, ACT 2614
AUSTRALIA
email: jcjeremy@ozemail.com.au

The deadline for the next edition of *The Australian Naval Architect* (Vol. 19 No. 4, November 2015) is Friday 30 October 2015.

The Australian Naval Architect
ISSN 1441-0125

Editor in Chief: John Jeremy AM
Technical Editor: Phil Helmore

Print Post Approved PP 606811/00009
Printed by B E E Printmail
Telephone (02) 9437 6917

CONTENTS

RINA Australian Division
on the
World Wide Web
www.rina.org.uk/aust

From the Division President

For those members involved in naval shipbuilding these are interesting times, with the Prime Minister announcing during his recent visit to Adelaide that all future surface naval warships will be built in South Australia, and that certain proposed naval projects would be brought forward. Presumably this is the Government's response to the difficulties reported by several of the Australian organisations involved in shipbuilding, including our Division, that skills could not be maintained when there was no overall planning for naval contracts, and which ultimately would lead to the so-called "Valley-of-Death" when there were no contracts and no employment prospects.

I believe that the Government initiative is to be applauded, as it suggests to me that the ups-and-downs of commercial work at the shipyards might to some extent be levelled out, and that a single centre of shipbuilding knowledge and skills might more easily be maintained in the one place, rather than scattered amongst various states and cities throughout Australia, as it is at present. The initiative does not suggest that one company is favoured over any other; rather it suggests that if you want to tender for naval shipbuilding, then you have to launch the complete product in South Australia.

We can probably now expect various corporate alignments so that companies involved in surface naval shipbuilding can claim some connection to South Australia.

Elsewhere, your Division Council is currently investigating various future potential activities, with the aim of streamlining the work of the Council and to raise the profile of the Division. It is in the public interest that RINA members are seen as the authority of choice on matters relating to ship, boat and offshore design and production, but it is a difficult task when anyone can call themselves a ship designer.

Travel safely.

Tony Armstrong

Editorial

The recent announcement by the Prime Minister that the Government will implement a continuous program of building naval surface ships in Australia will be welcomed by all of us who have been pressing for such a plan for decades. Whilst the plan will not completely overcome the fast-approaching trough in the naval shipbuilding industry's workload, the outlook for future years should be much improved, provided the plan is followed through into action.

The Prime Minister stated that this is the first time that an Australian government had made such a commitment. That is not really correct. The decision by the Australian government of 1946 to order the Daring-class destroyers was, in part, intended to maintain naval shipbuilding skills, and the program of ship construction which followed lasted for 20 years.

The ships built then proved to be costly and planned delivery dates were not met — the reasons for this were complex. It was a period of rapid increases in the cost of labour and material. The designs chosen were at an early stage of development when the cost estimates were made, the RAN was keen to incorporate the latest technology as it became available and changes were constant, and the contract bases did not encourage the Navy or the shipbuilders to manage the projects to deliver to a time and at a cost. Nevertheless, some fine ships were built and high-quality skills were retained, only to be squandered in the 1970s as we tried to do things a different way.

We can do better today, particularly if we are prepared to study the experience of the past and learn from it. Whilst some may decry the Government's plan as 'industry welfare' and the commitment to South Australia as political 'pork barrelling', naval shipbuilding is a strategic industry and similar challenges are faced and commitments made in many countries, including those with much larger defence order books than ours.

John Jeremy

HMAS *Stuart* in wintry seas off Sydney in July
(RAN photograph)

LETTER TO THE EDITOR

Dear Sir,

In a world which demands high energy production, many innovative creations have come to life to fulfil our needs. I would like to draw your attention to the traditional energy source, oil, and its off-shore production and storage by the floating production, storage and offloading (FPSO) unit. This is a vessel of large dimensions capable of producing, processing and storing oil and natural gas, once anchored in a defined location.

The search for oil brought mining companies to face the sea, not only with extensive wells of oil and gas, but also with challenges involving drilling, processing and transporting in a harsh environment. Oil has been produced from offshore locations since the late 1940s. Originally, all oil platforms sat on the sea bed but, as exploration moved to deeper waters and more-distant locations in the 1970s, floating production systems came to be used. The FPSO eliminates the need to lay expensive, long-distance pipelines from the processing facility to an onshore terminal. This can be an economically-attractive solution for smaller oil fields which can be exhausted in a few years and cannot justify the expense of installing a pipeline. Furthermore, once the field is depleted, the FPSO can be moved to a new location.

The first oil FPSO was *Shell Castellon*, built in Spain in 1977 and, today, there are around 200 vessels deployed. A majority of FPSOs entering the market in the next five years will head for the ultra-deep waters (defined as waters of depth greater than 1 500 m) of Brazil, West Africa and the Gulf of Mexico. Offshore Brazil is home to the largest number of FPSOs in service and on order worldwide, accounting for approximately 27%.

FPSOs are quicker than fixed platforms to develop and construct and, in many cases, they recycle ship-shaped hulls, reducing new-construction efforts. They are mobile and less costly to abandon at the end of the field's producing life. The great number of FPSOs in operation and on order speaks volumes for the solution's versatility, technology, and unprecedented safety.

Thales Lobato
UNSW student

Cape Wessel, seen here at her launching, was delivered to the Australian Border Force in July. The eighth and final ship to be built under Austal's $300 million design, build and support contract will be delivered later this year in accordance with the contract (Photo courtesy Austal)

NEWS FROM THE SECTIONS

Victoria

Ship Bio-fouling Management

John Lewis of ES Link Services gave a presentation on *Ship Bio-fouling Management — Latest Developments* to a joint meeting with the IMarEST attended by eighteen on 18 June in the Auditorium at Jacobs, 452 Flinders St, Melbourne.

Bio-fouling on hulls has always impacted on ship performance and maintenance, but now also raises environmental concerns through its effect on vessel energy efficiency and movement of invasive marine species. IMarEST has established a Special Interest Group (SIG) on bio-fouling management to enable communication and discussion on developing issues, and this talk provided an overview of this SIG and its activity.

John Lewis is a Principal Marine Consultant with ES Link Services. After studying marine botany at the University of Melbourne, John spent 30 years as a scientist at DSTO in Melbourne, working mostly on marine bio-fouling and its prevention. John now works as a private consultant with ES Link Services, primarily on bio-fouling impacts, antifouling technologies, and invasive marine species management. He is Chair of the IMarEST's Bio-fouling Management Expert Group.

Andrew Mickan

Water blasting of bio-fouling in dry dock
(Photo courtesy Biofouling Management Expert Group)

New South Wales

Committee Meetings

The NSW Section Committee met on 12 May and, other than routine matters, discussed:

- SMIX Bash: Accounts for 2014 finalised and returned a small surplus; *James Craig* has been booked for 2015.
- Recording of Technical Presentations: Engineers Australia is changing the recording engineers again; watch this space!
- Technical Meeting Program: Presentations being canvassed for July onwards by IMarEST and RINA.
- Walter Atkinson Award 2015: The call is out for nominations.
- Prizes for UNSW: The Year 3 Naval Architecture Prize was increased to $250; Year 1 and 2 prizes remain at $100.

The NSW Section Committee also met on 30 July and, other than routine matters, discussed:

- SMIX Bash 2015: Sponsors are being sought.
- Technical Meeting Program: Presentation for August re-arranged, and ideas for 2016 presentations canvassed. Date for October presentation coincides with Pacific 2015 International Maritime Conference events and this presentation has therefore been cancelled.

The next meeting of the NSW Section Committee is scheduled for 10 September.

Aluminium Ship Structures Research

Teresa Magoga of the Defence Science and Technology Organisation (DSTO) gave a presentation on *Aluminium Ship Structures Research: The Armidale Class Patrol Boats* to a joint meeting with the IMarEST attended by forty-two on 6 May in the Harricks Auditorium at Engineers Australia, Chatswood. This was the sixth-highest attendance of the 81 technical meetings held since Engineers Australia moved from Milsons point to Chatswood in June 2006.

Introduction

Teresa began her presentation by saying that she had come from an aerospace background, and was amazed to find that aluminium ships were welded—planes are *not* welded because aluminium loses half its strength when welded!

The research into ship structures, and that of the Armidale Class patrol Boats in particular, is all about asset management and lower cost of ownership. The capability life cycle comprises

- Needs: The identification of current and future gaps in capability, proposals to address these gaps, and definition of goals.
- Requirements: Definition of requirements, including operational support and specifications, and concepts evaluation.
- Acquisition: Procurement of appropriate materiel to meet requirements while achieving the best value for money over the life of the system.
- In service: A capability system is in operation; this requires support and is modified as necessary. Life-of-type refers to how long an asset will remain in service while being cost effective before it is required to be upgraded or replaced.
- Disposal: End of materiel system life.

There is a need for reliable life-of-type assessment. This will avoid cost over-runs (e.g. for unplanned maintenance), meet required platform availability, and maintain capability as an existing platform is decommissioned and the replacement enters service.

DSTO Naval Architecture has three branches: Structures; Seakeeping, Stability and Operational Loads; and Platform Systems Concepts and Analysis. These branches provide support to Navy Engineering, Projects (Defence Materiel Organisation) and Sustainment in the form of

- urgent in-service advice (e.g. for structural damage);
- enhanced naval architecture standards;
- advice on through-life management of platforms and systems;
- requirements definitions; and

- trade-off support.

Structural integrity assessment using finite-element analysis or in-service monitoring can show where there are stress concentrations and failures are more likely.

In general, planes are riveted (because they don't weld aluminium!) They have established usage monitoring programs, and use a damage-tolerance approach. On the other hand, large ships have a length of more than 100 m where wave (bending) loads dominate; they are typically constructed from steel because it is relatively easy to weld and less susceptible to fatigue.

However, high-speed craft are constructed of aluminium, which is welded, weight optimised, and sustains both wave (bending) and slamming loads which are both difficult to predict or measure in any sea environment. The Royal Australian Navy uses a safe life approach, i.e. a major failure of structure should not occur.

The Armidale-class Patrol Boats

The Armidale-class Patrol Boats (ACPB) are relatively high-speed semi-planing craft which are constructed from marine-grade aluminium alloys. They operate in tropical environments out of Darwin and Cairns. They were not designed to fatigue criteria, but were certified under Det Norske Veritas' High Speed Light Craft rules which gives them an implicit design life. Former Defence Minister, David Johnston, said in 2014 that the ACPBs "…have had an enormous output and work rate"!

ACPB HMAS *Larrakia* at sea
(Photo courtesy Austal Ships)

Many things feed into structural analysis (of stress distribution, fatigue and ultimate strength), including the hullform, material properties and degradation, the operational profile, the loads, the structural scantlings and, last but not least, hull monitoring systems.

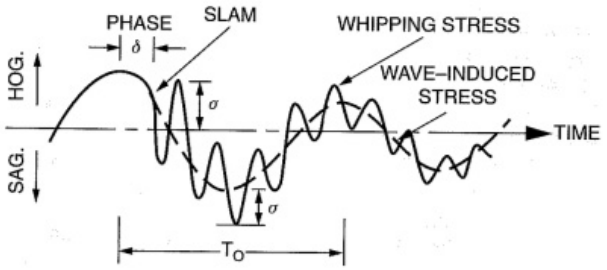
The outcomes of structural analysis

- facilitate informed operational decision-making;
- support asset management through provision of tools to assess fatigue life, as requirements and phase in life-cycle change; and
- assist with lowering cost of ownership.

Fatigue Life

Structural life-of-type can be dictated by fatigue life, where the structure fails due to exposure to numerous stress cycles. Fatigue damage accumulates until the load-bearing capacity of the structure falls below the applied load. Types of cyclic loads include inertial reactions to fluids in tanks (sloshing), loads imposed by rotating machinery, hydrodynamic loads from appendages and propulsive devices, wave loads (bending) and slamming.

In heavy seas, especially head seas, a vessel can experience such large heave and pitch motions that the bow emerges from the water on one wave and re-enters with a heavy impact or slam. A slamming event is seen structurally as a rapid increase of loading during the water entry and a transient vibration, or whipping, of the structure. The latter is observed as high-frequency load cycles superimposed on the low-frequency wave loading which decay during the slam event.



Slamming and whipping
(Image courtesy DSTO)

For high-speed craft, the slamming loads and associated responses have been known to have a significant impact on the stress magnitudes experienced by the structure. Further, slamming may have a considerable influence on the fatigue life of high-speed craft when compared to accounting for the global wave-induced stresses alone.

It would be useful to understand several things:

- slam event definition and detection on a specific ACPB;
- the effect of speed and heading on the number and severity of slam events;
- the correlation between stresses due to waves and slam events; and
- fatigue damage due to slamming.

However, there is inconsistency in the requirements for fatigue analysis and there are different assessment methods in use by DNV GL's *Rules for High Speed and Light Craft*, the *Rules for the Classification of High Speed Craft* established jointly by Bureau Veritas, Germanischer Lloyd and Registro Italiano Navale, *ABS's Guidance Notes on Structural Direct Analysis for High-speed Craft,* and Lloyd's Register's *Rules and Regulations for the Classification of Special Service Craft*. This is problematic for the industry!

The typical size and operational roles of HSC have increased, suggesting exposure to increasingly-harsh lifetime seaway loads.

There has been evidence of inadequate fatigue management during some stages of the capability life cycle. As an example, hull cracking of the Littoral Combat Ship led to a review of hull-girder, slamming and vehicle-deck design loads. Also, extended maintenance activities due to fatigue fracture have risked the availability for operations of ACPBs.

There is obviously a need for improved fatigue-life assessment of aluminium high-speed craft.

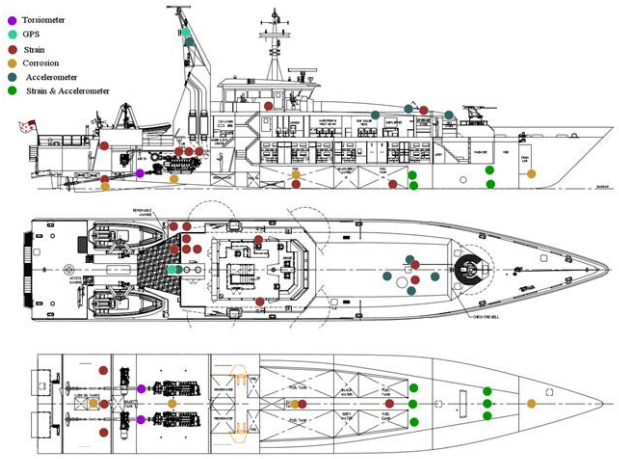
Fatigue Analysis Methods

Methods of fatigue analysis include:

- Spectral Fatigue Analysis: This requires a full ship structural model, together with a cached frequency-domain stress RAO database. A coarse mesh gives full ship damage screening, while a fine mesh gives selected area fatigue-damage assessment. The method has the advantage that it is easy, relatively quick, and is preferred when results are required at locations other than measuring points. However, the traditional method may be conservative for conventional ships, and does not account for wide-band processes, such as slamming excitation.
- Combination of Rainflow Counting and Cumulative Damage Theory: This combines rainflow counting of a measured stress-time series with the Palmgren-Miner rule to estimate damage accumulation. It has the advantage of being in the time domain, but it depends on the quality and length of stress data, and so several stress-time histories are need to obtain reliable statistics, which is costly and time-consuming, and the appropriate S-N curve must be used.

Hull Monitoring System

DSTO in collaboration with Austal Ships installed and commissioned a hull structural monitoring system on board one of the Darwin-based ACPBs, HMAS *Glenelg*. The monitoring system includes accelerometers, strain gauges, torsion meters to measure shaft power, a six degree-of-freedom rigid-body motion reference unit (MRU), and a Global Positioning System (GPS). The system was designed to continuously monitor and store its sensors' data at a variety of data rates for later remote analysis. The system design also allows for additional sensors to be added when required.

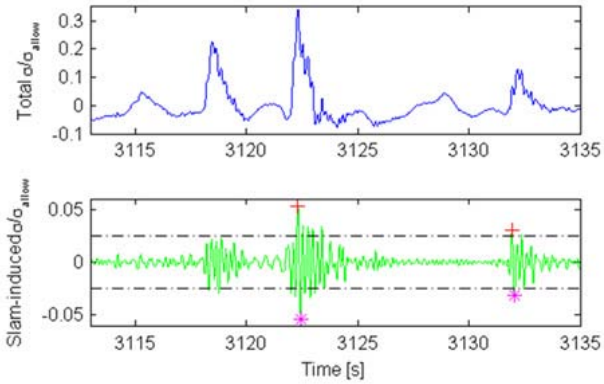


Hull monitoring on board HMAS *Glenelg*
(Drawing courtesy DSTO)

In the analysis of the measured hull-girder wave-induced and total stresses, rainflow counting has been used. Rainflow counting reduces a spectrum of stress ranges into a histogram of stress reversals or cycles. The approach is then to select a structural item, use its corresponding S-N curve, and calculate the resulting damage using the Palmgren-Miner rule.

Is Slamming Important?

Slamming induces high-frequency and often large-magnitude stresses, and so it is important to understand the structural response to slamming due to susceptibility to fatigue of aluminium ship structures.



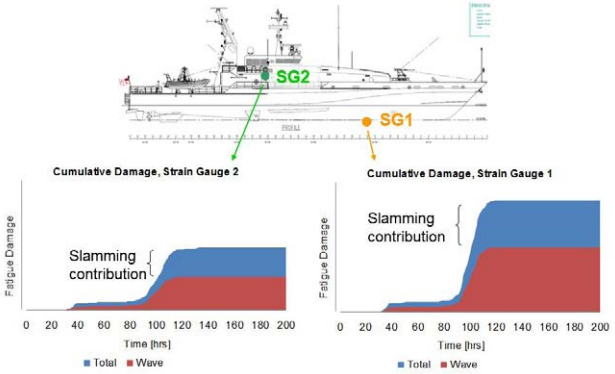
Total stress and slam-induced stress as a function of the allowable stress
(Graph courtesy DSTO)

Decomposition of the wave- and slam-induced contributions from the total value of the measured stress is useful for calibration of numerical models, and to understand the contribution of the individual stress components to fatigue. To decompose the stress-time record into its wave- and slam-induced constituents, the cut-off frequency which differentiates the low- and high-frequency signals was required to be found. To identify the cut-off frequency, spectral density estimations of the stress records were performed.

The total stress can be decomposed in the following way:

- Obtain the spectral density of the stress-time record and identify peaks in the response.
- Apply a filter to the stress-time record to retain the response frequency spectrum.
- Obtain the filtered stress-time record and its wave-induced and slam-induced components.

When this was done for 200 h of monitored records on HMAS *Glenelg,* it was found that damage due to slamming accounted for 37% of the total damage at Strain Gauge Location 1, and 46% at Strain Gauge Location 2. Fatigue damage can be significant when the vessel encounters a "rough" sea state for, say, a 24 h period within 200 h of continuous stress-time record.



Slam-induced contributions to total fatigue damage
(Graphs courtesy DSTO)

Fatigue Life Estimation at Areas of Interest

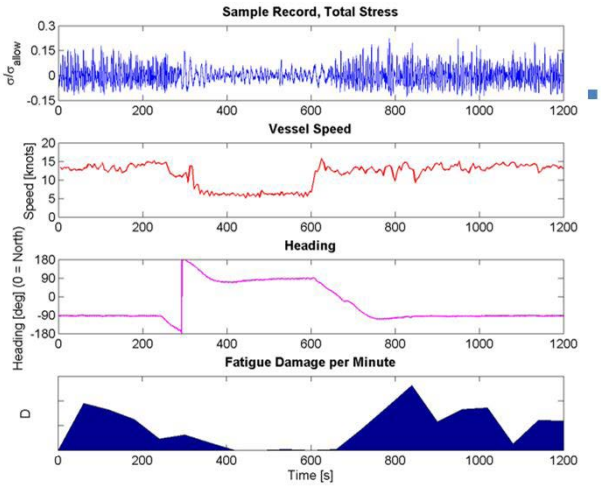
Stresses at strain-gauge locations do not necessarily represent the largest stresses observed in the structure. Strain gauges are located in relatively easy-to-access areas and away from the stress concentrations. General practice is to determine ratios between the stresses at the strain-gauge location and the locations of interest using finite-element analysis, with

mesh refinement at areas of interest, for both hogging and sagging conditions. Stress ratios are then applied to stress spectra at strain-gauge locations to determine the fatigue life at areas of interest.

The fatigue life is found by selecting the construction detail (area of interest) and finding the corresponding S-N curve. The stress ratio is applied to the stress spectrum of the strain-gauge location, and the fatigue life found as the duration divided by the damage.

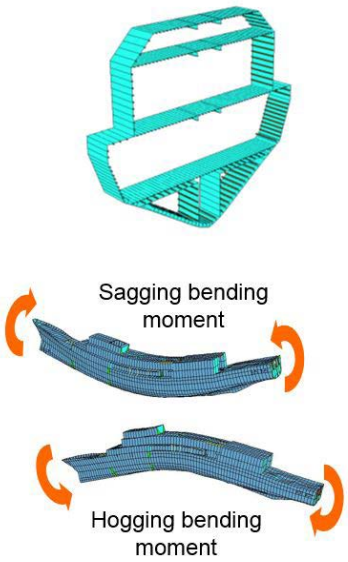
Operational Guidance

As an example of operational guidance provided to the ACPBs, the following graphs show that an increase in speed and encounter frequency leads to an increase in the number and magnitude of stress cycles and these, in turn, lead to an increase in the fatigue damage incurred.



Effect of speed and encounter frequency on fatigue damage
(Graphs courtesy DSTO)

Another interesting investigation by DSTO was the ultimate strength analysis of a generic aluminium patrol vessel. A one-bay model of the midship section was modelled, using 5083-H321 for plating and 6082-T6 for extrusions. An ALPS/HULL analysis was implemented in Owen Hughes' MAESTRO structural analysis program.



Ultimate strength analysis of midship section
(Drawing courtesy DSTO)

Interest centres on which of the following parameters has thd greatest influence on ultimate strength:

- initial plate deflection;
- initial plate residual stress
- initial stiffener distortion
- initial stiffener residual stress
- breadth of the heat-affected zone (HAZ); or
- ratio of HAZ stress to yield stress.

The analysis showed that the breadth of the HAZ provided the largest reduction in ultimate strength, closely followed by the initial plate deflection. The effects of these parameters on ultimate strength (e.g. relative to a "perfect" structure in the sagging condition) are summarised by Slight (7.9%), Average (17.0%) and Severe (34.1%) reductions.

Related Research Areas

DSTO has ongoing research in several related areas, including:

Corrosion of Marine-grade Aluminium Alloys

Possible causes include pollutants in grey water and/or bilgewater, galvanic action, biocides in fuel tanks, microbiologically-influenced corrosion, and concentrated chlorides. Various studies performed by DSTO indicate that the most-likely cause of bilge corrosion is concentrated chlorides.

Corrosion can best be minimised by good housekeeping (i.e. cleaning!), regular bilge inspection and inspection of grey- and black-water piping, regular flushing with reticulated water and pumping of bilges, trial painting of bilges, and application of suitable corrosion-inhibiting compounds.

Review of Maintenance Data

As an example, cracks were detected on the aft main deck, close to the deck edge. They had a database of ten Darwin-based boats, and cracking was first reported approximately two years after commissioning. This sort of information is good because it depends on the actual materiel state and can be used to verify the results of different fatigue analyses. However, the data quality is reliant on input from the surveyor and ship crew, and is limited in detail (i.e. there is little or no documentation of weld quality, the presence of corrosion, etc.)

Future Work

Planned areas of future work include further dedicated sea trials in which they obtain sea-state information; this is critical for validation of numerical predictions (both seakeeping and structural). Pressure gauges fitted to the hull can measure slam pressures and improve their understanding of slamming loads.

They would also like to incorporate the effects of pitting corrosion and multiple weld repairs in their structural analysis, and conduct spectral fatigue analysis using the finite element model.

Conclusion

DSTO has under way a large research program in semi-planing and aluminium ship structures, to support the ACPBs and future acquisitions. This program includes fatigue assessment, ultimate-strength assessment, sea trials and hull monitoring, and incorporation of the effect of age-related

degradation in the analysis. For each type of vessel, it is essential to do fatigue analysis.

Teresa acknowledged the contributions of Dr Seref Aksu, Dr Stephen Kennett, Mr Bruce Riding, Dr Stuart Cannon, and all DSTO staff involved with sea trials and the HMAS *Glenelg* sensor network.

Questions

Question time was lengthy and elicited some further interesting points.

Composites are a possible consideration for the SEA1180 proposed Offshore Combatant Vessel replacements for the ACPB (and other) vessels. The SEA1180 vessels will be larger than the ACPBs, but there would be question marks around our ability to build and maintain such large composite vessels.

HMAS *Maryborough* has also been instrumented like HMAS *Glenelg*. The former is the older vessel, but is not all original structure (some has been replaced). If they obtain enough data over a long period of time, then they can get statistically-significant results to be able to predict contractual days at sea. So far they have noticed no significant differences between measurements from *Maryborough* and *Glenelg*.

One area of interest was a bottom bracket connection to a pillar in the engine room. Pillars are usually in compression, but high stress levels were being shown in the finite-element analysis. This turned out to be in the hogging condition, which put the connection into tension, which is the stress under which cracks propagate.

The S-N curve shown for aluminium appeared to have a fatigue limit line, when aluminium does not exhibit such a limit. This is because Eurocode 9 gives a fatigue limit for more than 10^9 cycles, and DSTO use Eurocode 9 as do other stakeholders.

They do not have statistics on the number of cracks developed over the life of a ship. However, one should not be alarmed by the simple presence of cracks. The aerospace industry works on the principle of damage tolerance, i.e. tolerating the presence of cracks less than a certain size, but replacing structure when the cracks reach that critical size.

Some years ago, trials were done on HMAS *Glenelg* at a range of speeds over a range of headings relative to the sea direction, and the slams were measured. However, the significant wave height was of the order of 1.5 m, when they had been hoping for much higher, and they did not get the "rough" sea results expected. However, they did show more slams in head seas at faster speeds, as might be expected.

The design to DNV GL gives advice to the ship on the maximum speed to be used as a function of the significant wave height. If the limits are observed, then the life of the vessel can be expected to exceed 20 years. However, if the limits are exceeded, then the life will be reduced accordingly. In some countries, masters exceeding the limits (and thereby shortening the life of the vessel), would be slapped on the wrist. However, there is no such culture in the RAN. The ACPBs are expected to go to sea when other vessels don't.

The stress-monitoring locations are not necessarily subject to the highest stresses. It is hard to adhere the gauges in the regions of high stress, and these locations are not always easily accessible. The stress ratio approach is therefore often used.

Operators do try to minimise slamming impacts by changing speed and heading, and course deviations of 15–20º off the rhumb-line course are not uncommon.

They can obtain accelerations from the accelerometers placed on board. However, integrating twice to obtain the displacements is not reliable, because the accelerometers are subject to noise and are difficult to calibrate.

A measurement of the twist of the hull would give an indication of the heading of the vessel relative to the direction of the sea. About half of the gauges measure in the longitudinal direction only, and there are some rosettes. However, the longitudinal stresses are much greater than the transverse stresses. It is difficult to instrument the vessel for research purposes. It would be nice to have loads of sensors to measure everything, but that would be too expensive.

The Chief of Navy has expressed an interest in a bridge display of slam events for operator guidance on how to minimise the effects.

The vote of thanks was proposed, and the certificate and "thank you" bottle of wine presented, by Greg Hellessey, who suggested that perhaps we should re-visit rivetted ships! The vote was carried with acclamation.

Marine Surveyor Accreditation

Doug Matchett of the Australian Maritime Safety Authority (AMSA) gave a presentation on *AMSA'S Marine Surveyor Accreditation Scheme* to a joint meeting with the IMarEST attended by twenty on 3 June in the Harricks Auditorium at the Engineers Australia, Chatswood. The presentation described the background and benefits of the scheme through to summarising application requirements and duties of accredited marine surveyors working within in it.

Introduction

Doug began his presentation by saying that the National Surveyor Accreditation Scheme came into effect on 2 January 2015. Marine surveyor accreditation is a mechanism by which AMSA, as the National Regulator, can ensure that people are competent to conduct and provide survey reports for domestic commercial vessels under the National Law — Marine Safety (Domestic Commercial Vessel) National Law Act 2012. It has been brought into being by an amendment to regulations — Marine Safety (Domestic Commercial Vessel) Amendment (Surveyor Accreditation) Regulation 2014.

The creation of the regulation amendment has been the product of extensive consultation with the various state and territory maritime agencies and representative bodies, including the Australasian Institute of Marine Surveyors (AIMS), the International Institute of Marine Surveying (IIMS), the Royal Institution of Naval Architects (RINA), the Boating Industries Alliance Australia (BIAA), the classification societies and the Australian Maritime College (AMC), to name a few [*Extensive consultation with RINA appears to have been with one member of the Australian Division Council, and one wonders why UNSW Australia was not consulted like the AMC* — Ed.] It has been developed to cater for the needs and expectations of AMSA, its delegates, private operators and other external industry stakeholders.

Features and Benefits

Some important features of the AMSA-administered Marine Surveyor Accreditation scheme include:

- a consistent approach to accreditation for all surveyors, providing existing government and non-government surveyors with simple renewal processes to allow them to continue to work within the Domestic Commercial Vessel industry;
- a straightforward route for entry into the scheme for:
  - new government surveyors based on existing delegates' recruitment and employment practices;
  - new non-government surveyors to achieve accredited status; with a career path for surveyors who upskill; and
- Robust and transparent governance mechanisms, which include audits and centralised coordination of the scheme to ensure consistent, high-quality outputs in order to maintain the integrity of the national system.

How Does it Work?

There are four basic parts to the scheme:

Entry:

> Candidates apply to enter the scheme through clearly-defined application requirements for both new and previously-attested surveyors to AMSA.

Accreditation Scheme:

> Surveyors who are accredited under the National System carry out work within their field of competence in accordance with their obligations and requirements.

Renewal:

> Typically, accreditation will be valid for a five-year period. All accredited surveyors must renew their accreditation within three months prior to expiry.

Leaving the scheme:

> There are clearly-defined avenues within the regulation whereby an accredited marine surveyor may leave the scheme.

Regulatory Approach

The Surveyor Accreditation Scheme is grounded in AMSA's regulatory philosophy, which supports a coherent approach to marine safety regulation, i.e. one in which the amount of regulatory oversight reflects the level of risk posed by a particular operation. AMSA, as the National Regulator, sees safety as its main focus and acknowledges that there is a need for balanced regulation. The regulatory approach has arisen out of the streamlining review of the National System for Domestic Commercial Vessel Safety (National System) conducted in 2014.

The overview covers nine points:

- Safety is primary.
- Regulation — and its application — must be flexible enough to address the risks of a highly-varied industry in order to support safety, innovation and business and environmental sustainability.
- The National Regulator develops and maintains a collaborative relationship with industry.
- The regulatory scheme is performance-based, not prescriptive.
- The operator has the primary responsibility for ensuring that the vessel is safe and operates safely.
- The National Regulator will take a 'trust and verify' approach to maintaining safety wherever possible.
- The National Regulator will make use of third-party expertise to bolster its regulatory safety activities.
- The National Regulator will strive to make it simple for people to maintain safety.
- The National Regulator will work together with other safety agencies to reduce the potential for duplication of safety rules and the application of those rules.

What Does a DCV Surveyor Actually Do?

The crux of a domestic commercial vessel (DCV) surveyor's role is to undertake several duties:

Detect	Inspect and identify non-compliances with the relevant standards.
Assess	Decide the implications of the non-compliances on the vessel's fitness for purpose.

Rectify	What needs to happen to bring the vessel into compliance with the standards, and by when?
Communicate	Clearly and appropriately communicate to the necessary parties the requirements to rectify the non-compliance.

AMSA publishes several forms that surveyors must complete during the survey of a domestic commercial vessel. The principal ones are:

AMSA901	Survey Report (and Recommendation for Periodic Survey) is for the surveyor to use when conducting an initial survey and is for the surveyor's records.
AMSA586	Survey Activity Report is to be provided to the vessel owner or agency if the surveyor wishes to raise any matters which require addressing before a certificate of survey can be issued.
AMSA606	Surveyor Recommendation to the National Regulator is to be provided to the vessel owner or agency if the surveyor is satisfied that the vessel meets survey requirements and is fit for purpose; this can be submitted to AMSA as part of the application for certificate of survey.

Survey forms can be downloaded from the AMSA website at www.amsa.gov.au/domestic/surveyors-manual/.

Copies of all forms and documentation relating to a survey are to be retained by the surveyor for future reference. AMSA may request this information when issuing a certificate of survey or during conduction of an accreditation audit.

Who Can be Accredited?

A surveyor applying for accreditation is assessed against the qualifications and experience they have acquired during their career. They are also assessed on their capability to conduct their surveyor duties and business in line with National Law requirements.

A surveyor can be accredited against categories which are based on their experience and qualifications. The categories also provide an opportunity for conditional accreditation, should it be required, so that a surveyor can 'earn as they learn'.

The accreditation categories were developed during the consultation process and relate to survey activities described in NSAMS 4 and the NSCV.

Examples of qualifications required for accreditation include, but are not limited to:

- a degree or equivalent in naval architecture, marine engineering or similar;
- postgraduate qualifications in naval architecture, marine engineering or similar;
- a diploma or higher-level qualification in marine surveying, marine engineering or similar (e.g. MAR 13 Diploma in Marine Surveying);
- trade qualifications as a shipwright, boatbuilder, engineer or similar;
- seagoing qualifications relevant to the category of accreditation sought;
- relevant military qualifications demonstrating training as above; and
- other qualifications demonstrating a depth of knowledge of the category of accreditation sought (e.g. fibre composites, electrical engineering, metallurgy, etc.)

Examples of experience include, but are not limited to:

- significant design experience in sectors related to vessel design;
- five or more years' experience in a full-time marine survey role;
- a number of years' experience in construction and commissioning of vessels; or
- a number of years of seagoing experience.

An accredited surveyor must also be suitably capable of running and conducting their business and personal development in line with the requirements of the regulation. Examples of capability include, but are not limited to:

- the capability to operate a quality business that is certified to the requirements of ISO 9001:2008 (or equivalent), or in accordance with the Marine Surveyors Accreditation Guidance Manual;
- the capability to secure and hold professional indemnity insurance;
- the capability to gain and hold professional association membership and maintain continuing professional development related to vessel building, design, engineering or survey;
    - professional associations include RINA, AIMS, IIMS, IMarEST, MSA, BIAA, etc.;
    - examples of CPD include confined-spaces training, first-aid certificate, lead-auditor training, conference attendance, etc.; and
- broad peer acceptance, demonstrated through character references from within the industry.

Categories of DCV Surveyors

A surveyor seeking AMSA accreditation needs to identify the categories that are applicable to their qualifications and experience prior to applying. A surveyor may be accredited against one or more of the following categories:

Initial Survey

- Plan approval
- Stability approval
- Load line assignment
- Electrical (extra-low voltage)
- Electrical (low voltage)
- Electrical (high voltage)
- Construction or alteration (hull, deck and superstructure)
- Construction or alteration (machinery)
- Construction or alteration (loadline—conditions and markings)
- Construction or alteration (equipment)
- Construction or alteration (commissioning)

Periodic Survey

- Periodic survey
- Electrical
- Load line

Other

- Survey of safety equipment
- Survey of communications equipment

All electrical categories, other than extra-low voltage, require an AS3000 licence for the respective State or Territory in which they intend to work.

Getting Into the Accreditation Scheme

All prospective surveyors will need to make an application. All those, except for persons grandfathered into the scheme (currently attested), should expect to attend a panel interview. Panel interviews will be structured to determine your behaviour as a surveyor and technical ability based on the survey categories you applied for. The interview panel will determine whether you demonstrate that you are capable of holding accreditation. Successful persons will be issued a five-year accreditation document and be able to start work.

How to Apply

Application forms can be downloaded from Section 4 in the Surveyor Accreditation Manual on the AMSA website, www.amsa.gov.au/domestic/surveyors-manual/.

All surveyors, previously attested or otherwise, must submit a ***new*** application form to apply for accreditation under the Surveyor Accreditation Scheme for the first time.

Prospective government surveyors are to use form AMSA 594 which includes a declaration from the delegate that the surveyor is already attested for the categories applied for. Non-government (private) surveyors are to use formAMSA 741.

Non-government, or private, surveyors should use the form AMSA741 (including surveyors who are accredited under Marine Safety Queensland scheme).

Elements required for the non-government application form are:

- Applicant details (name, contact details and ABN if applicable).
- Categories of accreditation applied for and conditions (if known).
- Continuing professional development — List any CPD courses you have completed (in addition to your qualifications) relevant to your application.
- Satisfaction of eligibility requirements — Supporting documentation must be certified (unless otherwise stated) and submitted with your application to meet the eligibility requirements.
- Referees.
- Applicant's photograph — Must be certified as true and correct, which is consistent with the Attorney-General's standards for providing proof-of-identity for issuing government ID cards.
- Previous accreditation — This is to declare whether you have had accreditation suspended or revoked in the past.
- Professional Association Membership — This is to declare whether you have had membership of a professional association suspended or revoked in the past.
- Applicant's declaration and consent — Provides consent to the National Regulator to publish, on the AMSA website, your name and contact details and state(s) in which you will conduct surveys.

The application for accreditation is either to be via post or in person to the AMSA head office in Canberra. The address may be found on the AMSA website.

Satisfaction of Eligibility Requirements

All supporting documentation for the application must be certified (unless otherwise stated) and submitted with your application to meet the eligibility requirements. Section 2 of the Surveyor Accreditation Manual on the AMSA website provides more information on what constitutes a certified copy.

Important pieces of supporting documentation, include:

- A copy of your current curriculum vitae, stating your qualifications, experience and capability (this does not need to be certified).
- Evidence of qualifications — Certified copies of each of the degree/diploma/certificates relevant to the categories applied for.
- Evidence that your (or your employer's) business is, or will soon be, able to conduct surveying under a Quality Management System (this may be a certificate showing compliance with ISO 9001:2008 (or equivalent), or a letter or undertaking stating that business will be conducted in accordance with the National Law — Marine Surveyors Accreditation Guidance Manual 2014, prepared by the National Regulator, as in force from time to time.
- A copy of your (or your employer's) professional indemnity insurance certificate, or a quote for insurance if not yet obtained (this does not need to be certified).
- Certified copies of certificates, or letters of professional association membership and any continuing professional development undertaken — professional association membership and continuing professional development demonstrate that your capability as a marine surveyor is formally recognised within the industry. CPD evidence may be in the form of a log which you keep as part of your requirements for membership of a professional association, or certificates of attainment/completion of courses which you have undertaken relevant to your application. This will assist AMSA in the assessment of the application and determining the capabilities of a surveyor to undertake duties in certain categories applied for.
- Two current passport-sized photographs, certified as true and correct on the reverse side and with dimensions of 35 mm × 45 mm, not including the border.
- An original or certified copy of a document which provides proof of your identity — either a document issued by an Australian government department or agency (e.g. birth certificate, driver's license, passport, immigration papers, etc.) or a foreign passport. It is important that this document provides your date of birth.

Staying In the Scheme or Getting Out

The principles of a surveyor working within the scheme include:

- Surveyors will need to work within their areas of accreditation within the requirements of the National Law and hold professional indemnity insurance for the duration of their accreditation.

- Surveyors are to submit their recommendations using the AMSA-prescribed forms to a delegate of the National Regulator the purposes of the issue of National Law certificates. Surveyors may submit work to any delegate for this purpose.
- Surveyors can expect to be audited formally at least once during the course of their five-year accreditation.
- Surveyors will need to maintain CPD in accordance with professional body requirements. Evidence of this CPD will be required to be submitted in the application for renewal; however, a surveyor may be asked for at for this information any time by AMSA.
- When a surveyor decides to stop working, there is a simple notification requirement and an exit interview.

Serious Stuff

The scheme exists principally to ensure that the process of conducting surveys is consistent and robust. AMSA is committed to ensuring its integrity and sustainability in line with the requirements of the National Law. Whilst marine surveyors accredited under the scheme are not employed directly by AMSA, as surveyors they are representatives of AMSA.

The addressing and avoidance of conflicts of interest are important parts of the accredited surveyor requirements under the National Law. These include the designing, building and surveying vessels in which you have a personal interest outside of your conduct and business as an Accredited Marine Surveyor. If you are unsure about what may constitute a conflict of interest, it is important to contact the National Regulator for further information.

Entering and working within the National Law is serious business which requires commitment and application.

Before considering an application for accreditation, look at the information available and consider carefully whether it is right for you — AMSA staff are always available to assist you with your queries and suggest you research carefully before you commit to an application.

Where to Find Further Information

Further information can be found in the Surveyor Accreditation Manual, available at www.amsa.gov.au/domestic/surveyors-manual/ or by phoning the National System hotline on (02) 6279 5000, or email national.system@amsa.gov.au.

Online training modules are provided at the AMSA Learning Centre which is accessed via the Domestic page on the AMSA website, or directly via www.amsa.gov.au/domestic/training/ This is available to all external users — these are the same training modules available as on the National Regulator Information Portal (NRIP). Online training modules include:

- Role of an Accredited Marine Surveyor — provides information in relation to the Surveyor Accreditation Scheme under the National Law; and
- Identify Marine Surveyor Tools — assists Marine Surveyors in their role by identifying survey tools available on the AMSA website.

Conclusion

Doug concluded his presentation by saying that the National Surveyor Accreditation Scheme commenced on 2 January 2015 and is currently in a year of transition. It will evolve as the National System evolves. It needs good people to step up and enter the profession and requires marine surveyors to remain engaged and up to date.

Full details of the scheme are available on the AMSA website.

The vote of thanks was proposed, and the certificate and "thank you" bottle of wine presented, by Graham Taylor. The vote was carried with acclamation.

Submarine HMAS *AE2*

Roger Neill and Martin Rowan of the Defence Science and Technology Organisation gave a presentation on *The 2014 Maritime Archaeological Survey of the Sunken Submarine HMAS* AE2 to a joint meeting with the IMarEST attended by forty-one on 1 July in the Harricks Auditorium at Engineers Australia, Chatswood.

The 2014 Maritime Archaeological Survey of the sunken submarine HMAS *AE2* presented the science team with many challenges. Each of these challenges, considered in isolation, would be regarded as 'adding scientific interest' to the survey. Considered together, however, they presented the science team with a project that carried a high level of risk but, assuming success, very high pay-off.

The experimental requirements of the survey were complex and multi-faceted. The science team developed a strategy which would allow investigation of *AE2* to be undertaken from physical, material science, and maritime archaeology perspectives. Being one of very few remaining, relatively-intact submarines of its era, the project aimed to answer questions raised by naval historians. Being the largest intact, in-situ remnant of the Gallipoli campaign, there were also obvious requirements for the team to undertake the survey in a manner which showed due respect for all of the combatants who fought in that campaign.

From an experimental design perspective, the team developed a set of procedures which managed experimental risk whilst complying with acknowledged standards for maritime archaeologic surveys. The strategy was to plan for the known, and to have resources on hand to overcome the problems arising from the unknown. The procedures took account of the unique nature of the site, the submarine, and the support infrastructure.

The scientific program achieved virtually all of its goals, having overcome many hurdles. It enabled *AE2* to be cathodically protected. The condition of the submarine is now much better understood. Naval historians and maritime archaeologists now have access to a wealth of new information. Finally, because of the outstanding results of the survey, *AE2*'s story is all the richer. It can now be told through a '21st century lens'.

This presentation covered the 2014 expedition, the challenges presented, how they were dealt with, and the successes.

It is expected that the presentation will be written up in the November 2015 issue of *The ANA*.

The vote of thanks was proposed, and the certificate and "thank you" bottle of wine presented, by Craig Boulton. The vote was carried with acclamation.

The Flexible Multi-role Warship

John Jeremy of the Royal Institution of Naval Architects gave a presentation on *The Flexible Multi-role Warship* to a joint meeting with the IMarEST attended by 25 on 5 August in the Harricks Auditorium at Engineers Australia, Chatswood.

As the complexity and cost of the modern warship increased during the 20th Century, warship designs capable of being adapting to different roles and circumstances were produced in an attempt to avoid the cost of using, for example, a large, powerful warship as a patrol boat — "using a Rolls-Royce to squash cockroaches".

This presentation reviewed the attempts made since World War II to simplify ship design and construction by developing warships which could mount mission-specific systems in a common hull. The most-recent high-profile development of this concept is the US Navy's Littoral Combat Ship program, comprising two hull designs which can be adapted for particular missions by loading containerised packages to adapt to different roles. Flexible designs such as these may be the path to follow to provide more cost-effective warships in the future.

John's presentation is written up elsewhere in this issue of *The ANA*.

The vote of thanks was proposed, and the certificate and "thank you" bottle of wine presented, by Craig Boulton. The vote was carried with acclamation.

Phil Helmore

COMING EVENTS

NSW Section Technical Meetings

Technical meetings are generally combined with the Sydney Branch of the IMarEST and held on the first Wednesday of each month at Engineers Australia, 8 Thomas St, Chatswood, starting at 6:00 pm for 6:30 pm and finishing by 8:00 pm.

The program of meetings for remaining for 2015 (with exceptions noted) is as follows:

2 Sep Selwyn Oliveira, Marine and Diesel Manager, Alfa Laval Australia
PureDry: Reducing a Ship's Fuel Costs by Re-using Waste Fuel Oil

7 Oct No meeting; Pacific 2015 events

3 Dec SMIX Bash

FAST 2015

The thirteenth International Conference on Fast Sea Transportation (FAST) will be held on 1–4 September in Washington, DC, USA, the nation's capital. Since their inception in Trondheim, Norway, in 1991, the FAST conferences, held every two years, have been the world's leading technical conferences addressing fast sea transportation issues.

The aim of the conference is to promote world-wide cooperation among scientists, engineers and operators who are concerned with all aspects of the high-speed maritime industry. The FAST Conference program for 2015 will focus on high-quality papers and invited keynote lecturers. A thorough review process, of both abstracts and full manuscripts, will be used to select papers whose originality, relevance, timeliness, and significance meet the standards FAST attendees have come to expect. The conference will be conducted in the English language.

The conference website is at www.sname.org/fast2015. For further information, please contact Ms Alana Anderson by email aanderson@sname.org or phone +1-703-997 6705.

Pacific 2015 IMC

The next Pacific International Maritime Conference, organised by the Royal Institution of Naval Architects and the Institute of Marine Engineering, Science and Technology and held in conjunction with the Pacific International Maritime Exposition and the Royal Australian Navy's Sea Power Conference, will be held in Sydney on 6–8 October 2015 to coincide with Navy Week, and will be held at an all-new venue: the Sydney Exhibition Centre at Glebe Island. The change in dates from the traditional January–February timeslot is a result of the success of Pacific 2013, which was held in October 2013 to coincide with the Royal Australian Navy's Centenary celebrations and International Fleet Review on 4 October. In consultation with the Royal Australian Navy, the biennial Pacific International Maritime Exposition will in future coincide with Navy Week during the first week in October.

The new Pacific 2015 venue, Sydney Exhibition Centre at Glebe Island, has deep-water berths alongside. In conjunction with Sydney Ports Corporation, arrangements have been made to allow RAN and visiting warships to berth directly adjacent to the exposition, and this will make it quicker and more convenient to attend ceremonial events or undertake ship visits.

Conference delegates, exhibitors, and trade visitors will be able to get to Glebe Island by car or bus, or by ferry direct from Circular Quay and Darling Harbour, enabling them to enjoy the experience of one of the world's great natural harbours.

Details and Registration

Full details of registration costs and entitlements are available on the IMC conference website, www.pacific2015.com.au/international-maritime-conference. Conference registrations are now open.

For further information regarding the Pacific 2015 International Maritime Conference contact the Conference Secretariat at imc2015@amda.com.au, phone +61 (0)3 5282 0543 or fax +61 (0)3 5282 4455.

Contract Management for Ship Construction, Repair and Design

Fisher Maritime's widely-respected three-day training program, *Contract Management for Ship Construction, Repair and Design*, will be available in Brisbane on 4–6 November and in Melbourne on 10–12 November 2015.

This program is a lessons-learned one, not a theoretical course on contract management. It bears a lot of "scar tissue" from marine contractual disasters. It is designed for:

- Project Managers (Yards and Owners)

- Contract Managers and Specialists
- Newbuilding Shipyards and Repair Yards
- Fleet Managers
- General Managers of Shipyards
- Financial Managers (Yards and Owners)
- Ship Conversion Specialists
- Naval Architects and Marine Surveyors
- Federal, State, and Provincial Agencies
- Ferry Operators (Public and Private)
- Naval Shipyards
- Owner's Representatives
- On-Site Representatives
- Major Equipment Vendors
- Marine Superintendents
- Consultants and Attorneys

The presenter, Dr Kenneth Fisher, is recognised worldwide as the leading authority on the development and management of complex contracts and specifications for ship construction, conversion, repair, and design. He is author the of the 2004 RINA publication, *Shipbuilding Specifications: Best Practices Guidelines*, and of the 2003 SNAME publication, *Shipbuilding Contracts and Specifications*. As an arbitrator, expert witness, consultant, and instructor for nearly 30 years, he brings clarity and organization to an otherwise-complex set of management requirements unique to the maritime industry.

For details of topics covered, visit www.fishermaritime.com/publications/pdf/cm.pdf, and for registration, visit www.fishermaritime.com/projecttraining/registration.html and click on the button for *Register for our Aust/NZ Programs*.

Basic Dry Dock Training Course

DM Consulting's Basic Dry Dock Training is a four-day course which covers the fundamentals and calculations of dry docking. The next course in Australia will be held on 1–4 February 2016, in Melbourne.

The course begins with the basics and safety concerns, and progresses through all phases of dry docking: preparation, docking, lay period, and undocking. The course ends with a discussion of accidents and incidents.

It is designed to be relevant to dock masters, docking officers, engineers, naval architects, port engineers and others involved in the dry docking of ships and vessels. The course is presented through classroom lectures, student participation in projects, and practical application exercises. The course addresses the deck-plate level of practical operation needed by the dock operator and the universally-accepted mathematical calculations required to carry out operations in accordance with established sound engineering practices.

"The course was excellent, straight forward and comprehensive. Instruction was great, expected 'death-by-PowerPoint, but was pleasantly surprised. I am better acquainted with dry dock basics after the course and can trust the accuracy of the training based on the extensive experience of the instructors. Thank you! Very informative, very thorough."

Topics to be covered include:

- Basic dry docking community terminology
- Calculations
- Safe dry docking procedures
- Lay period
- Undocking evolutions
- Docking Plans
- Docking and undocking conferences
- Hull boards
- Vessel stability
- Incidents/accidents

"Fantastic. Really good course. Personally, I got a lot out of the course and will certainly recommend it to my work colleagues."

"Very informative. Subject matter which was dry, was taught without being boring. Class was great, learned a lot! Thank you."

Joe Stiglich, the course leader, is a retired naval officer, qualified NAVSEA docking officer and holds a master's degree from MIT in naval architecture and marine engineering. Responsible for over 250 safe docking and undocking operations, he currently runs a series of conference and training courses for personnel involved in all

The Royal Institution of Naval Architects

Institute of Marine Engineering, Science & Technology IMAREST

ENGINEERS AUSTRALIA

PACIFIC 2015 International Maritime Conference

Sydney Exhibition Centre @ Glebe Island, Sydney Australia

6-8 October 2015

CONFERENCE PROGRAM NOW AVAILABLE ONLINE...

The **Pacific 2015 International Maritime Conference** program is now available for viewing online at the conference website.

www.pacific2015.com.au/international-maritime-conference

The Royal Institution of Naval Architects, Institute of Marine Engineering, Science & Technology and Engineers Australia invite you to attend a thought-provoking program of plenary and technical presentations. In addition, the following Keynote speakers will also provide presentations of great relevance to both the commercial and defence industries.

Tuesday 6 October 1000-1030	***Mr. Dale Ormond,*** Principal Director, Research, Office of the Assistant Secretary of Defense (Research and Engineering) United States of America
Tuesday 6 October 1030-1100	**United Kingdom Defence Materiel Reform** ***Mr Bernard Gray,*** Chief of Defence Materiel, United Kingdom
Wednesday 7 October 0830-0900	**Enterprise Naval Shipbuilding Plan** ***Rear Admiral Mark Purcell,*** RAN, Head Maritime Systems, Capability Acquisition and Sustainment Group, Australia
Thursday 8 October 0830-0900	**United States Naval Science and Technology Strategy** ***Dr Patricia Gruber,*** Technical Director of Office of Naval Research Global, United States of America

The conference program is designed to permit all delegates to visit the many industry displays on show at the ***PACIFIC 2015*** **International Maritime Exposition,** and the opportunity to conduct informal professional discussions with exhibitors and fellow delegates. Registration for the International Maritime Conference includes free access to the exposition.

You can register for the **Pacific 2015 International Maritime Conference** at the conference website:

www.pacific2015.com.au/international-maritime-conference

For further information contact the ***PACIFIC 2015*** International Maritime Conference Secretariat at:
PO Box 4095, Geelong VIC AUSTRALIA 3220 **Phone**: +61 (0)3 5282 0543 **Fax**: +61 (0)3 5282 4455 **Email**: imc2015@amda.com.au

AOG

AUSTRALASIAN OIL & GAS
EXHIBITION & CONFERENCE
24–26 FEB 2016
PERTH CONVENTION EXHIBITION CENTRE

CALL FOR SPEAKERS NOW OPEN

APPLICATIONS CLOSE
10TH AUGUST, 2015

NEW THINKING FOR AUSTRALIAN OIL & GAS

CALL FOR PAPERS IS STILL OPEN.
DON'T MISS OUT !
RINA.AOGconference@gmail.com

AOG CONFERENCE - KEY THEME 'COLLABORATION'

The 2016 Conference will focus on the theme of 'Collaboration' to support the industry with greater efficiencies and innovation as it transitions from construction to operations. AOG is seeking applications for presentations addressing the key areas impacting the industry and those that offer new thinking for the Australian oil & gas industry.

ROYAL INSTITUTION OF NAVAL ARCHITECTS TOPICS
Fixed and Floating Offshore Structures

- Design, Construction, Installation, Operation & Decommissioning
- Fixed & Floating Offshore Structure
- Offshore Renewable Energy
- Ships for Offshore Operations
- Station-keeping Systems

OTHER TOPICS

- Australian Industry Participation (submission by invite only)
- FLNG (submission by invite only)
- Human Capital (submission by invite only)
- Maintaining Asset Integrity & Safety in a Cost Sensitive Environment (submission by invite only)
- Safety (submission by invite only)

SUBSEA TOPICS

- CRA & ECA Pipeline Session
- Disruptive Technology
- Efficiency Through Innovation
- Flow Assurance - One piece of the puzzle
- Industry Benchmarking – Standards, Training & Competency
- Learning from the "BOOM" years: New Discoveries and Innovations in Geo-sciences & Geo-engineering
- Offshore IMR suitable for Australian Environment Conditions
- Pipeline & Subsea Solutions to Positively Influence Project Economics
- Productivity Improvements – Innovations in Technology & Systems
- Soils & Pipelines
- Subsea & Pipeline Repair and Remediation
- Subsea Intervention
- Subsea Decommissioning
- Subsea Emergencies – Security, Management & Mitigation

Please submit your application online at aogexpo.com.au/cfs

For topic suggestions or queries please contact: **aog@divevents.com.au** or call **+61 3 9261 4500**

For sponsorship and exhibitor inquiries please call: **+61 3 9261 4500**

Supported by

Government of Western Australia
Department of Commerce

City of Perth

Conference partners

SUT Society for Underwater Technology

Subsea Energy Australia

Subsea UK

phases of the dry docking industry and acts as a consultant for ship repair companies.

For further information and to register please see www.drydocktraining.com.

AOG 2016 Forms Partnership with RINA

AOG 2016 organiser Diversified Communications and The Royal Institution of Naval Architects (RINA) are inviting submissions for a special conference stream on Fixed and Floating Offshore Structures at the AOG Exhibition and Conference (AOG) 2016.

The Call for Speakers for the RINA-supported Fixed and Floating Offshore Structures conference stream follows the recent signing of a new partnership agreement between the RINA and AOG 2016.

In announcing its participation in AOG 2016, the RINA Chief Executive, Trevor Blakeley, said that RINA was very pleased to be joining with AOG in organising a conference stream focussing on technical developments in design, construction and operation of structures and marine vessels in the offshore industry. The new stream aims to provide a forum for interaction of all professionals in this area with special emphasis on the Australian specifics, challenges and capabilities.

AOG Event Director at Diversified Communications, Bill Hare, said that it was the continued and growing collaboration with respected independent professional associations such as RINA that has helped maintain AOG as one of the leading global oil and gas industry events.

"AOG 2016's theme is about collaboration and we believe that, in down times like this in the oil and gas sector, it is even more important for industry, government and event organisers like ourselves to work together to provide an opportunity for discussions and information sharing which can promote innovations and opportunities to improve efficiencies," Mr Hare said.

The AOG 2016 Call for Speakers is now out, with AOG seeking applications for presentations addressing the key areas impacting the industry and those that offer new thinking for the Australasian oil and gas sector.

Entering its 35th year, the AOG Exhibition and Conference 2016 will be staged at the Perth Convention Exhibition Centre from 24 to 26 February 2016.

For more information and to submit your application please go to http://aogexpo.com.au/call-for-speakers/.

About AOG 2016

The multi-award winning Australasian Oil and Gas Exhibition and Conference (AOG) has been bringing together global and local oil and gas industry leaders and providing a showcase for technical and technological breakthroughs in Perth, Western Australia, for over 35 years. Australasia's largest oil and gas industry event attracted over 620 exhibitors from more than 25 countries, and to bring more than 14 000 visitors, exhibitors and conference delegates from around the world in 2015. Next year's event will be held at the Perth Convention and Exhibition Centre from 24–26 February, 2016. Further information: www.aogexpo.com.au.

CLASSIFICATION SOCIETY NEWS

Sea Trade Award for DNV GL classed *Ampere* — World's First Fully-electric Vessel

Ampere, the world's first large fully-electric vessel, has received the Seatrade Clean Shipping award for 2015. Owned and operated by Norled and designed and constructed by Fjellstrand, the DNV GL-classed car ferry is a fully battery-driven catamaran made of aluminium. Innovative not only in its propulsion system, but in its highly-efficient hull design, the 80 m long vessel is able to carry 120 cars and 360 passengers across the Sognefjord between the villages of Lavik and Oppedal in Norway.

Compared to a standard diesel ferry serving the same route, *Ampere* saves about one million litres of fuel annually, as well as preventing 2640 t of carbon dioxide from entering the atmosphere. Emissions of particulate matter, NOx and SOx are also eliminated. In economic terms, battery hybridisation of ferries can provide potential fuel cost savings of 10–30%, with a payback time of three-to-five years, while all-electric ferries can produce fuel cost savings of 50–80%.

DNV GL CEO now UN Global Compact Board Member

United Nations Secretary-General, Ban Ki-moon, has appointed Dr Henrik Madsen, Group President and Chief Executive Officer of DNV GL, as a new board member to the UN Global Compact Board, the world's largest voluntary corporate sustainability initiative.

As a board member, Dr Madsen will join other leaders from business, labour and civil society, and serve as a champion of the UN Global Compact and its mission. In his letter of appointment, Secretary-General Ban Ki-moon welcomed Dr Madsen to "this joint effort to strengthen and guide the United Nations Global Compact", and said that he is looking forward to working with him "through the Board towards our shared vision of a sustainable and inclusive global economy."

Jotun High-performance Solutions and DNV GL's ECO Insight

DNV GL and the Norwegian paint manufacturer, Jotun, signed a cooperation agreement to work on improving hull performance at the bi-annual Nor-Shipping Conference in Oslo recently. The project will bring together two performance-management services, Jotun's Hull Performance Solution and DNV GL's ECO Insight solution, to collect and analyse data on hull degradation. This will enable customers to cut their fuel bills and reduce emissions.

Experts suggest that hull and propeller degradation account for up to 17% of the world fleet's fuel costs and greenhouse gas emissions. Advanced hull coating solutions or more-regular hull and propeller cleaning are already widely accepted as effective preventive measures. However, there is no conclusive evidence showing which coating solution is the most effective, or when and how often propellers need to be cleaned.

The agreement covers all vessels which buy Jotun's high-performance coating from now on, and they will be offered NI+EI (including a CFD model for the hull-degradation module) as part of that package to validate the savings made by the Jotun coating

DNV GL e-Newsletter, June 2015

The submarine-intervention-gear ship *Besant* in Cockburn Sound approaching Fleet Base West in Western Australia on 6 July 2015. Built in Vietnam the vessel, named after LCDR Thomas Besant, Commanding Officer of the submarine AE1, will be joined later in the year by the longer rescue-gear ship, *Stoker*. The two vessels will replace *Seahorse Standard* enhancing Australia's submarine rescue capability
(RAN photograph)

GENERAL NEWS

Naval Shipbuilding Plan

On 4 August the Commonwealth Government announced a long-term plan intended to provide Australia with a strong and sustainable naval shipbuilding industry. Over the next 20 years the Government plans to invest over $89 billion in ships and submarines for the Navy.

The investment is expected to generate significant economic growth and sustain several thousand Australian jobs over decades.

The Government will implement a continuous building programme of surface warships in Australia — Australia's shipbuilding workforce will build Navy's future frigates and offshore patrol vessels.

The Government said that this is the first time that any Australian government has committed to a permanent naval shipbuilding industry.

This strategy is intended to transform Australia's naval shipbuilding industry and put it onto a sustainable long-term path, giving the workforce certainty into the future.

The Government has announced that it is:

- Bringing forward the future frigate programme (SEA 5000) to replace the Anzac-class frigates. This decision will confirm a continuous onshore building programme to commence in 2020 — three years earlier than scheduled under the previous Defence Capability Plan. This decision is expected to save over 500 hundred jobs and help reduce the risks associated with a 'cold start'. The future frigates will be built in South Australia, based on a competitive evaluation process which will begin in October 2015.
- Bringing forward by two years construction of offshore patrol vessels (SEA 1180) to replace the Armidale-class patrol boats, with a continuous onshore building programme commencing in 2018 following a competitive evaluation process. This decision will maintain around 400 skilled jobs which would otherwise have been lost. It will also reduce the number of manhours which would be wasted on the future frigate programme if the existing workforce was disbanded and reconstituted, setting it on a stronger path for earlier completion.

In the short term, these two measures will sustain around 1000 jobs which would otherwise have been lost. Once both programmes ramp up they will guarantee around 2500 Australian shipbuilding jobs for decades.

The third major pillar of the Government's naval shipbuilding plan will be based on the outcomes of the competitive evaluation process (CEP) for Australia's future submarines.

Overseen by an independent panel of experts, the CEP will ensure that capability, cost, schedule, and key strategic considerations — along with Australian industry involvement — are carefully and methodically considered by the Department of Defence. There will be more submarines and more submarine-related jobs in Australia.

The Government believes that addressing the serious cost overruns, delays and productivity problems affecting the air-warfare destroyer programme is essential to restore public confidence in Australian naval shipbuilding and ensure that future projects deliver world-class capabilities for the Defence force and value for taxpayers.

Following a forensic audit, and building on significant improvements made through the recent interim phase of reforms, the Government is acting decisively to reform the AWD programme. By the end of October 2015, substantial additional shipbuilding management expertise will be inserted into the AWD programme and an additional $1.2 billion will be invested in the programme budget.

The Government will also undertake further reform of ASC to ensure that Australian shipbuilding is best structured to support a continuous build programme and future naval projects are delivered on time and on budget.

To this end, the Government has commissioned a strategic review of ASC's shipbuilding capacity. The review will consider how best to implement long-term arrangements.

Recognising that the Adelaide shipyards and workforce are strategic national assets, the review will consider options to ensure that they are structured to support the Government's commitment to naval shipbuilding. This will include discussions with the South Australian Government on the future of its Common User Facility at Techport which forms an important part of the Adelaide shipyards.

The outcomes of the review will be considered in conjunction with future decisions on submarines and surface-ship building programmes.

This investment in Navy capability will be a centrepiece of the fully-funded Defence White Paper which will be released later this year. It will set out the Government's plan to equip the Australian Defence Force to meet current and future challenges.

AWD Program Issues

In late May the Government announced that it had finalised a forensic audit to quantify the level of cost and schedule overruns in the air-warfare destroyer project.

The audit reported that the most-reliable estimates now suggest that the project will require an additional $1.2 billion for its completion.

Delivery of the three destroyers has also been significantly delayed:

- Ship 1 (*Hobart*): Original delivery: December 2014, revised estimate: June 2017
- Ship 2 (*Brisbane*): Original delivery: March 2016, revised estimate: September 2018
- Ship 3 (*Sydney*): Original delivery: June 2017, revised estimate: March 2020

The Government has initiated a series of interim reforms to put the project back on track, pending the completion of the forensic audit.

Improvements have been made to the senior management at ASC Shipbuilding, and additional shipbuilding and related capability from Navantia, BAE Systems and Raytheon Australia has been provided.

Mr Mark Lamarre, from United States naval shipbuilder, Bath Iron Works, was appointed as the Interim Chief Executive Officer of ASC Shipbuilding to bring a competent, experienced shipbuilder to the ASC leadership role.

Mr Lamarre came to that role with 25 years of AEGIS shipbuilding experience gained from several senior management roles.

The Government stated that it would begin a limited tender process on 29 May 2015, seeking proposals to either insert a managing contractor into ASC for the remainder of the AWD program, or to further enhance ASC capability through a partnering arrangement.

Austal Awarded Contract to Construct 70 m Fast Crew Boat

In June Austal announced that it has entered into a contract with Caspian Marine Services Limited of Azerbaijan to construct one 70 m fast crew boat.

The contract is valued at $US34 million (approximately $44.5 million).

The 30 kn, 150 passenger catamaran will be jointly built in Austal's Philippines and Henderson shipyards, with delivery expected in Australia in the third quarter of 2016.

Caspian Marine Services Limited operates a fleet of offshore marine-support vessels, serving the offshore oil and gas exploration and production industry in the Caspian Sea region. The 70 m fast crew boat will transport crew and cargo to offshore platforms, operated by the State Oil Company of Azerbaijan (SOCAR) and British Petroleum (BP).

Austal's Chief Executive Officer, Andrew Bellamy, said that the contract is another significant milestone in Austal's penetration into the offshore crew-boat market.

"The award reinforces Austal's continuing leadership in high-speed aluminium vessel construction and is a great opportunity to further mature the integration of our supply chain between our Philippines and Henderson operations," Mr Bellamy said.

The contract builds on the award of two 45 m crew-transfer vessels for the Abu Dhabi National Oil Company under construction in Austal's Philippines shipyard.

Austal Delivers High-speed Catamaran Ferry

In August Austal delivered the first of two high-speed catamaran ferries to the Abu Dhabi National Oil Company.

The contract for two 45 m catamaran ferries was awarded in April 2014 and is valued at approximately $30 million, with the vessels constructed at Austal's Philippines shipyard.

Austal's Chief Executive Officer, Andrew Bellamy, said that the on-time and on-budget delivery demonstrates Austal's ability to compete in this target market.

"We continue to see opportunities in the Middle East and the energy sector, and have the right production cost base in the Philippines to compete for commercial vessel contracts and successfully leverage our intellectual property with a proven design," Mr Bellamy said.

The second ferry is in its final stages of construction and is expected to be delivered later this year.

Austal's 45 m high-speed catamaran ferry for Abu Dhabi
(Photo courtesy Austal)

A World Record Spanning 25 Years

Twenty-five years ago headlines around the world announced a new world record, the fastest crossing of the Atlantic Ocean, by a ship built in Australia.

Incat Tasmania is proud to record that 23 June 2015 marked 25 continuous years that Incat-built fast ships have held the record for the fastest Transatlantic Crossing.

On 23 June 1990 *Hoverspeed Great Britain*, a ship (Incat hull 025) built by Incat in Tasmania, for operation between England and France by Sea Containers Ltd, broke the record for the fastest crossing of the Atlantic Ocean by a commercial passenger ship.

The crossing from Ambrose Light at New York commenced at 7.30 pm on 19 June 1990 and she ended her 2922 n mile trip at Bishop Rock in the UK on the morning of 23 June.

The Hales Trophy is awarded to "The ship which shall, for the time being, have crossed the Atlantic Ocean at the highest average speed". It is not simply reaching the highest speed momentarily — the right to fly the Blue Riband is a test of endurance as well, because the high speed needs to be maintained over the entire crossing (naturally slower at the beginning with a full fuel load and becoming faster at the end of the journey).

The previous record had been held for 38 years by SS *United States* (1952–1990). Before *United States* won, great liners vied for the honour to fly the Blue Riband.

The Incat-built high-speed catamaran *Hoverspeed Great Britain*, which broke the record winning the Hales Trophy on 23 June 1990, held the record and the owners held the Trophy until 1998 when another Incat-built ship, *Catalonia,* took the record in June 1998. Then just a month later in July 1998, yet another ship built by Incat, *CatLink V* broke the record.

It was the first time in the history of the transatlantic records (dating back to the 1860s) that three ships to win the trophy in succession had been built by the same shipyard.

There have been no challenges to the record which was set in July 1998, and none are in sight. The current record is 41.284 kn average over two days, 20 hours and 9 minutes.

The Hales Trophy is a heavily-gilded ornate trophy over 1 m in height and it is on display in the Fast Ferry Museum located at the Incat shipyard in Hobart.

The ship then known as *Hoverspeed Great Britain* is now operating as *Cosmos Jet* for Sea Jets in Greece.

Australia's first air-warfare destroyer, *Hobart*, on the shiplift in Adelaide before her launching on 23 May 2015. Construction and fitting out of *Hobart* is well advanced and she is expected to begin sea trials during 2016
(Photo courtesy AWD Alliance)

NUSHIP *Hobart* ready for launching. Her place on the hardstand at ASC Shipbuilding in Adelaide has now been taken by *Brisbane* for final block consolidation and fitting out before her launching
(RAN photograph)

Mrs Nicola Hodgman (left) with Chief of Navy VADM Tim Barrett, AO, CSC, RAN, at the ship's bow after cutting the ribbon and naming the ship during the official launching ceremony of the future HMAS *Hobart*
(RAN photograph)

NUSHIP *Hobart* afloat in the Port River in Adelaide on 23 May 2015
(Photo courtesy AWD Alliance)

LCS 6 Delivered to USN

The future USS *Jackson* (LCS 6), completed US Navy acceptance trials at the beginning of July. The trials, the last significant milestone before delivery, were undertaken in the Gulf of Mexico and involved comprehensive testing of the vessel's major systems and equipment by the US Navy.

Austal's Chief Executive Officer, Andrew Bellamy, said that it was pleasing that acceptance trials on LCS 6 had been successfully completed.

"The LCS program is maturing into an efficient phase of construction. Completion of our first acceptance trial on LCS 6 as the prime contractor is a significant and important milestone for Austal. This program is steadily gaining momentum, heading towards a smooth transition from LCS to frigate," Mr Bellamy said.

LCS 6 was delivered to the US Navy during a ceremony at the Austal USA shipyard in Mobile, Alabama, on 11 August. Jackson is the fifth LCS to be delivered to the US Navy, the third of the Independence variant. To be commissioned in December 2015, she will operate out of Mayport, Florida, while conducting full-ship shock trials, prior to joining her sister ships in their homeport of San Diego in late 2016.

Austal will deliver a further nine LCS under a ten-ship, $US3.5 billion block-buy contract to the US Navy. Of those, *Montgomery* (LCS 8) is preparing for trials and delivery later this year, and *Gabrielle Giffords* (LCS 10) was recently christened. Final assembly is well underway on *Omaha* (LCS 12) and *Manchester* (LCS 14). Modules for *Tulsa* (LCS 16) and *Charleston* (LCS 18) are under construction in Austal's module manufacturing facility.

Jackson, LCS 6, was handed over by Austal USA to the US Navy on 11 August (Photo courtesy Austal)

High-speed Crew Boat Contract for Austal

In June Austal announced that it had secured a further offshore vessel contract for the construction of one 57.6 m high-speed catamaran crew boat for an undisclosed operator based in SE Asia, for $US20 million (approximately $26 million).

The advanced, multi-task crew boat will be capable of quickly and safely transferring 90 offshore personnel plus cargo at up to 40 kn and will be wholly constructed at Austal's Philippines shipyard for delivery in the third quarter of 2016.

In addition to a large, 200 m^2 cargo deck (allowing up to 100 t of cargo to be transported), the vessel features DP2 Dynamic Positioning which allows stable, heave-compensated walk-to-work transfer of personnel to offshore facilities. The vessel also has search-and-rescue capability, with an on-board fast rescue craft available for launch quickly when necessary.

HMAS *Choules* In-service Support Contract

In June the Australian Government awarded an in-service support contract to maintain the Bay-Class Landing Ship Dock, HMAS *Choules*, over the next two years.

The maintenance contract awarded to Atlantic & Peninsula Australia Pty Ltd (A&P Australia) is a fixed-price performance-based commercial arrangement. The contract has an initial value of $60.6 million and will see the continuation of nearly 30 jobs in the Sydney region.

With a growing maritime industry in Australian, United Kingdom-based company A&P Group Limited expanded its operations by creating a local Australian subsidiary, A&P Australia.

Parent company A&P Group Limited has been maintaining HMAS *Choules* since the vessel was acquired from the UK Government in October 2011.

The entry of A&P Australia into the local maritime sustainment market strengthens Australian naval sustainment capability and will provide Navy with a valuable continuity of experience and knowledge, now and into the future.

Expert Advisory Panel Appointed to Oversee Future Submarine Competitive Evaluation Process

With France, Germany and Japan having confirmed their participation as potential international partners in Australia's future submarine programme, on 5 June the Government announced the establishment of an Expert Advisory Panel, which will oversee the competitive evaluation process.

The Expert Advisory Panel is intended to assure the Government that the competitive evaluation process remains sound, is conducted in accordance with probity and accountability principles, and that participants have been treated fairly and equitably.

The members of the Expert Advisory Panel are:

- Prof. Donald Winter, a former Secretary of the United States Navy;
- The Hon. Julie Anne Dodds-Streeton, a former Justice of the Federal Court of Australia;
- Mr Ron Finlay, one of Australia's leading infrastructure specialists with extensive legal experience; and
- Mr Jim McDowell, a member of the First Principles Review team with extensive Defence experience.

Collectively, these advisers share extensive experience in complex military acquisition programs, legal and probity matters, and major projects.

Defence has advised that Australia will need an international partner to deliver the future submarine programme and that a competitive evaluation provides the best opportunity for Australian industry to maximise their involvement in the programme without compromising capability, cost, schedule or risk.

NUSHIP *Adelaide* entering the Captain Cook Dock at Garden Island on 26 June during her sea trials before completion by BAE Systems and delivery to the RAN later this year. Her sister ship, HMAS *Canberra* is berthed at the fitting out wharf (RAN photograph)

The Government expects that significant work will be undertaken in Australia during the build phase of the future submarine, including combat systems integration, design assurance and land-based testing. This will result in the creation of at least 500 new high-skilled jobs in Australia, the majority of which will be based in South Australia.

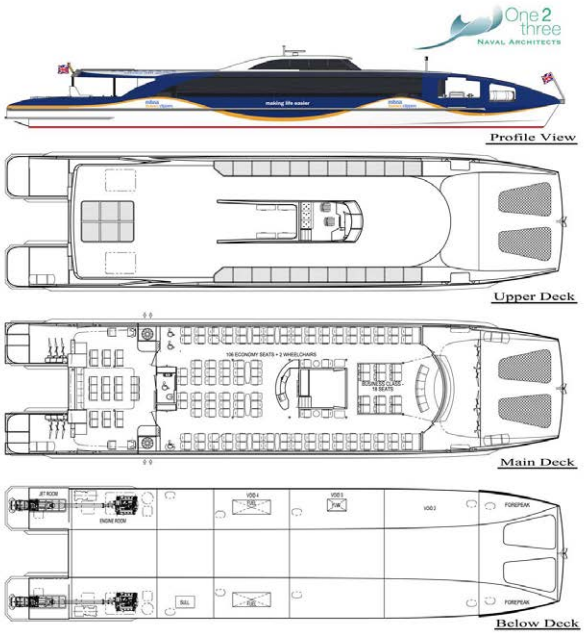
34 m Catamaran Ferries from One2three Naval Architects

MBNA Thames Clippers have confirmed an order for two One2three-designed 34 m low-wash river catamarans for operation on the River Thames in London.

The vessels were launched at Incat Tasmania in July and will join Thames Clippers' existing fleet in operation between Putney and Woolwich. The two 34 m vessels were designed primarily for the river intra-city commuter and tourist routes, and feature a passenger capacity of 160 in a mix of interior and external seating.

The vessels are powered by twin Scania DI 13 engines rated at 625 kW and coupled to ZF 2000 gearboxes driving Rolls-Royce A3-40 waterjets for a cruising speed of 25 kn.

Starboard bow of 34 m catamarans for River Thames (Image courtesy One2three Naval Architects)



General arrangement of 34 m catamarans for River Thames (Image courtesy One2three Naval Architects)

Principal particulars of the new vessels are

Length OA	35.37 m
Length WL	32.67
Beam OA	8.80 m
Beam moulded	8.30 m
Depth moulded	2.15 m
Draft	1.00 m
Passengers	160
Fuel oil	22×1500 L
Fresh Water	500 L
Sullage	500 L

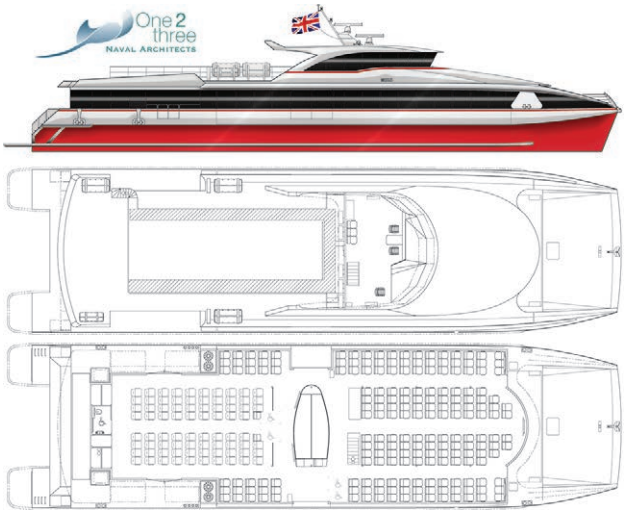
Main engines	2×Scania DI 13 each 625 kW at 2300 rpm
Gearboxes	2×ZF 2000
Waterjets	2×Rolls-Royce A3-40
Speed (service)	25 kn

Red Jet 6 from One2three Naval Architects

Red Funnel Ferries, one of the oldest ferry companies in the world, has recently announced the development of *Red Jet 6*, the latest addition to the cross-Solent fleet.

The announcement has been made by CEO, Kevin George, at Venture Quays where the new high-speed vessel is being built with a local workforce and the creation of up to 50 jobs including apprenticeships. Shemara Refit won the construction order for *Red Jet 6* by offering a competitively-priced One2three-designed vessel which met Red Funnel's design brief and desire to have the vessel built on the Isle of Wight. Confidence in Shemara Refit's management capabilities and quality of workmanship stemmed from the impressive restoration of the famous motor yacht, *Shemara,* for Sir Charles Dunstone.

The One2three-designed *Red Jet 6* will enter service in Summer 2016 with production started in July of this year at a cost of £6.1million, but Kevin George says that voyage prices won't go up just because a new Red Jet is coming. Passengers will experience a quiet, spacious and well-lit cabin with leather seats and a sophisticaed air-handling system. A new high-bandwidth ship-to-shore wi-fi system will be free to customers and provisions have been made to carry a total of 22 bicycles and four wheelchairs.



General arrangement of *Red Jet 6*
(Drawing courtesy One2three Naval Architects)

Principal particulars of *Red Jet 6* are

Length OA	41.12 m
Length WL	37.94 m
Beam moulded	10.87 m
Depth	3.80 m
Draft	1.30 m
Passengers	275 seated 4 wheelchairs
Crew	6
Bicycles	22
Fuel oil	5000 L
Fresh water	1000 L
Sullage	500 L
Main engines	4×MTU 10V 2000 each 900 kW @ 2250 rpm
Propulsion	4×MJP 500 DRB waterjets
Generators	2×Perkins Sabre each 63 kW 415 V 3ϕ 50 Hz
Speed	38 kn @ 85% MCR
Classification	DNV HSLC&NSC
Flag	UK

Steve Quigley

41 m Catamaran Passenger Ferries from Incat Crowther

Incat Crowther has announced that it is designing a pair of 41 m catamaran passenger ferries for WETA of San Francisco. The design of the vessels, which will be built by Kvichak Marine Industries, showcase Incat Crowther's ability to analyse, dissect, and meet a set of requirements.

The vessel features an isolated cabin, to be built under subcontract by Nichols Brothers Boat Builders, and carries 400 passengers. The layout of the cabin responds to stringent requirements for seating configuration, with a mix of forward-facing and booth seats, with and without tables. The elevated wheelhouse offers excellent visibility, meeting operational requirements.

In responding to the tender, the team worked hard to offer improvements in passenger flow, snack-bar functionality and utility space. Ticket counters on each passenger deck are located in such a manner as to not obstruct passenger ingress, improving turnaround times.

Large midship boarding doors combine with aft gates to allow quick boarding and disembarkation. The aft gates lead directly to the large aft bicycle-storage area. Forward of this is an amenities area featuring three toilets (two of which are fully ADA-compliant) and the snack bar. An extra-wide internal staircase leads from here to the upper deck, further aiding passenger flow.

Incat Crowther collaborated with Kvichak Marine Industries and Nichol Brothers Boat Builders in 2007 to successfully produce a quartet of ferries for WETA. *Gemini, Taurus, Scorpio* and *Pisces* remain among the world's most environmentally-friendly ferries, and the new vessels will build on this with greater efficiency from their improved hullform and the use of the latest in selective catalytic-reduction technology. Fitted with a pair of MTU 12V4000 main engines producing 1453 kW each, the vessel will have a service speed of 27 kn. The vessel exceeds stringent wake-wash requirements set out in the tender.

Starboard bow of 41m catamaran passenger ferry
(Image courtesy Incat Crowther)

Principal particulars of the new vessels are

Length OA		41.15 m
Length WL		40.80 m
Beam OA		11.30 m
Depth		3.55 m
Draft	(hull)	1.63 m
	(propeller)	2.00 m
Passengers		325 internal
		75 external
Fuel oil		11 356 L
Fresh water		2840 L
Sullage		2840 L
Main engines		2×MTU 12V4000 M64
		each 1453 kW @ 1800 rpm
Propulsion		2×5-bladed propellers
Speed	(service)	27 kn
	(maximum)	29 kn
Construction		Marine grade aluminium
Flag		USA
Class/Survey		USCG Subchapter K

Starboard quarter of 41m catamaran passenger ferry
(Image courtesy Incat Crowther)

Kilimanjaro V from Incat Crowther

Incat Crowther has announced the delivery of *Kilimanjaro V*, the eighth Incat Crowther-designed vessel for the Tanzania-based operator Azam Marine.

Built by Richardson Devine Marine in Hobart, the 39 m passenger ferry is a rugged and efficient catamaran, designed specifically as a high-capacity passenger and cargo vessel for the operator's new route, an exposed and sometimes rough run, from Dar es Salaam to the island of Pemba via Zanzibar.

As capacities of successive *Kilimanjaro* vessels have increased, together with spectacular patronage growth since the series of vessels was introduced, increasing emphasis has been placed on the passenger experience, including boarding and disembarkation. *Kilimanjaro V* has three boarding locations per side, serving the main-deck cabin, the upper deck via the aft stairs, and the upper-deck premium cabin via a set of private stairs. Each class of cabin has its own entry to streamline passenger movement, whilst a dedicated ramp allows for the loading of luggage carts without crossing the path of any passengers.

Kilimanjaro V's main deck is fitted with 252 seats while, upstairs in first class, there is spacious seating for 52 passengers and 104 premium-classed passenger seats. The sun deck houses 96 passengers on calm days, making a total of 522 passengers and 10 crew.

Below decks, bunks and a bathroom provide overnight accommodation for six crew members.

Kilimanjaro V is powered by two Cummins QSK60 main engines and is propelled by two five-bladed propellers. Recent sea trials saw *Kilimanjaro V* easily achieve her contract cruise speed of 30 kn and a top speed of 34 kn at full load and 100% MCR.

The vessel is compliant with HSC Code stability criteria and has increased structural allowances and plate thicknesses to add robustness and longevity, given the difficulty of service in the region.

With the ninth vessel already under construction, Incat Crowther is pleased to continue contributing to the growth and success of Azam Marine, providing vessels targeted specifically at the operator's needs for rugged, efficient, high-capacity low-maintenance vessels.

Principal particulars of *Kilimanjaro V* are

Length OA		39.00 m
Length WL		38.90 m
Beam OA		11.00 m
Depth		3.90 m
Draft	(hull)	1.48 m
	(propellers)	2.25 m
Passengers		304 internal
		218 external
Crew		10
Fuel oil		2×6000 L
Fresh water		1×1500 L
Sullage		2×1500 L
Main engines		2×Cummins QSK60-M
		each 1864 kW @ 1900 rpm
Propulsion		2×five-bladed propellers
Speed	(service)	30 kn at full load
	(maximum)	34 kn at full load
Construction		Marine-grade aluminium
Flag		Tanzania
Class/Survey		Structure compliant with DNV GL HSLC Stability compliant with HSC Code 2000

Kilimanjaro V on trials
(Image courtesy Incat Crowther)

Benreoch from Incat Crowther

Incat Crowther has announced the delivery of *Benreoch*, a 30 m wave-piercing catamaran utility craft built by Veecraft Marine in Cape Town, South Africa. The vessel was developed specifically for crew transfer to offshore platforms in Nigeria.

At 30.3 m in length and 8.5 m in beam, *Benreoch* is 2.7 m longer and 1.0 m wider than her predecessors, *Topaz Zenith* and *Topaz Zephyr*. The larger platform has been used to increase the aft working-deck capacity, with a 53 m^2 cargo area and rescue boat and crane. The aft deck is large enough to carry 10 ft and 20 ft containers in various configurations, and is fitted with a 20 ft self-contained accommodation module which houses 8 special personnel.

Inside the main-deck cabin is seating for 22 passengers in large, comfortable forward-facing seats. A captain's cabin with ensuite is fitted on the main deck, as are a 4-person cabin and 6-person cabin, each with their own bathroom.

A galley and mess are fitted to starboard, as well as a small laundry. Stairs adjacent lead to the upper-deck wheelhouse and to the hulls, housing a twin cabin each.

The wheelhouse has ballistic protection and features forward- and aft-facing control stations and excellent visibility over the cargo deck and foredeck, enhanced by high windows and blinds forward and aft, offering clear visibility for personnel and cargo-transfer or fire-fighting duties.

A unique benefit of the wave-piercing hulls allows *Benreoch*'s bow to interface cleanly with the offshore platform, whilst being well clear in all other areas to avoid risk of hull damage and crush injuries. To eliminate the risk of damage to the forepeaks or having the hull hang up on structures, the vessel's bows are well back from the outline of the foredeck.

The vessel offers excellent functionality and enhanced safety, whilst retaining the wave-piercing catamaran's speed and offshore capabilities.

Fitted with a pair of Caterpillar C32 ACERT main engines, each producing 1081 kW, *Benreoch* has a cruising speed of 26 kn and a maximum speed of 30 kn.

Principal particulars of *Benreoch* are

Length OA		30.3 m
Length WL		25.0 m
Beam OA		8.50 m
Depth		3.20 m
Draft	(hull)	1.35 m
	(propellers)	1.90 m
Passengers		22
Crew		15
Cargo-deck area		53 m^2
Fuel oil		30 000 L
Fresh water		4000 L
Sullage		500 L
Main engines		2×Caterpillar C32 ACERT each 1081 kW @ 2300 rpm
Propulsion		2×propellers
Generators		2×Caterpillar C4.4
Speed	(service)	26 kn
	(maximum)	30 kn
Construction		Marine-grade aluminium
Flag		Nigeria
Class/Survey		BV ✠ Hull ✠ Machinery, Crew Boat, Sea Area 2

Benreoch on trials
(Photo courtesy Incat Crowther)

Benreoch shows off her fire-fighting capability
(Photo courtesy Incat Crowther)

Benreoch executing a turn
(Photo courtesy Incat Crowther)

33 m Catamaran Passenger Ferries from Incat Crowther

Incat Crowther has announced the design of a new class of 33 m catamaran passenger ferries for Majestic Ferries in Singapore, to operate between Singapore and Batam. With four of the vessels already under construction at PT Cahaya Samudra Shipyard in Indonesia, the design will deliver increased capacity and speed, and offer substantial fuel savings in return on the operator's significant investment in the new fleet.

The vessels will be powered by a pair of MAN D2862 LE463 main engines driving fixed-pitch propellers. With 1029 kW per hull, the vessels will cruise at 28 kn and will be built to the HSC Code 2000 under Bureau Veritas survey.

All of the vessel's 200 passengers will enter through midship boarding doors and sit in forward-facing seats. In addition, there are four seats for crew members. At the aft end of the cabin are a 6-person crew room and kiosk, as well as three heads.

The upper deck, free of passengers, features just the wheelhouse with excellent all-round visibility.

This contract for four vessels is an endorsement of Incat Crowther's expertise in developing fuel-efficient solutions which offer operators a commercial advantage.

Principal particulars of the new vessels are

Length OA		33.0 m
Length WL		32.7 m
Beam OA		8.50 m
Depth		2.80 m
Draft	(hull)	1.20 m
	(propellers)	1.96 m
Passengers		200
Crew		8
Fuel oil		7000 L
Fresh water		2000 L
Sullage		1000 L
Main engines		2×MAN D2862 LE463 each 1029 kW @ 2100 rpm
Propulsion		2×5-bladed propellers
Generators		2×Perkins 6TG2AM 76 ekW
Speed	(service)	28 kn
	(maximum)	31 kn
Construction		Marine-grade aluminium
Flag		Singapore
Class/Survey		BV ✠ Hull ✠ Machinery, HSC Category A, Sea Area 2

Starboard bow of 33m catamaran passenger ferries for Singapore
(Image courtesy Incat Crowther)

33 m Catamaran Dive Vessel from Incat Crowther

Incat Crowther has announced that a contract has been signed to design a 33 m catamaran dive vessel for Down Under Cruise & Dive of Cairns. Construction of the vessel is well underway at Marine Engineering Consultants on Queensland's Gold Coast.

Incat Crowther were approached by Down Under Cruise & Dive to create a design which offered the ultimate passenger experience, with the class and style of a motor yacht, yet retained the rugged and efficient properties of an aluminium commercial vessel. Incat Crowther responded to the brief

with an attractive, spacious and comfortable vessel which maximises the passengers' experience on the reef. Interior spaces are large and well glazed, and outdoor spaces are fitted out with comfortable lounges and are well protected from the sun.

However, the vessel's great party trick will be when she's at rest at the reef. Not only will she feature a lifting stern platform (which Incat Crowther pioneered on their early-1980s reef vessels), but she will also feature aft port-and-starboard fold-down platforms. When positioned, these three platforms will encircle the aft end of the vessel, providing comfortable and safe access to the water.

Boarding will be via gates aft and amidships on the main deck, as well as additional gates on the upper deck.

The main cabin has seats for 151 in a mixture of booth configurations. Passengers are served by two large catering spaces aft — a bar to port and a kiosk to starboard. Aft of this are toilets and access to the aft deck, complete with wetsuit, snorkel and dive-tank storage spaces.

A large set of stairs on the aft main deck leads to the upper deck, with outdoor seating and the lifeguard's lookout. Inside the upper-deck cabin there is booth seating for 46 passengers, as well as a VIP room for 10. Forward of the wheelhouse are integral and comfortable sun lounges for passengers to relax, as well as a stairway down to the foredeck.

The roof deck features forward-facing seats as well as lounges aft. This deck is covered by a solid roof and accommodates 70 passengers, offering exceptional visibility and comfort.

The vessel is to be fitted with two MAN D2862 LE463 engines which will power the vessel to a 25 kn cruising speed.

Upon developing the concept in partnership with Down Under Cruise & Dive, Incat Crowther performed an extensive construction tender process on behalf of the operator, demonstrating the breadth of expertise and service available to achieve a successful outcome.

Principal particulars of the new vessel are

Length OA		33.1 m
Length WL		32.4 m
Beam OA		9.30 m
Depth		3.20 m
Draft	(hull)	1.30 m
	(propellers)	2.10 m
Passengers		200
Crew		20
Fuel oil		2×4000 L
Fresh water		2×3000 L
Sullage		2×2000 L
Main engines		2×MAN D2862 LE463 each 1029 kW @ 2100 rpm
Propulsion		2×fixed-pitched propellers
Generators		2×Cummins 6BT5.9-D(M) 50 Hz
Speed	(service)	25 kn
Construction		Marine-grade aluminium
Flag		Australian
Class/Survey		NSCV 1C

Stewart Marler

Port quarter of 33 m catamaran dive vessel
(Image courtesy Incat Crowther)

Lady Tierney from Incat Crowther

Incat Crowther and Halimar Shipyard have announced the successful delivery of *Lady Tierney*, a 62 m monohull DP-2 ABS-classed USCG-certified crew-supply vessel for Sea Supply, Inc., a B&J Martin Inc. subsidiary, of Galliano, Louisiana. With design expertise from Incat Crowther's Lafayette, LA, office, combined with concept design and standards from the Morgan City, LA-based shipyard and the vessel owner, the vessel will meet the needs of the demanding deep-water offshore industry in the Gulf of Mexico.

For transportation of supplies, *Lady Tierney* features a large aft cargo deck comprising 367 m^2 of timber-covered area with a capacity of 443 t. Also featured on the aft deck are two FFS 1200LB, 20 kL/min fire monitors for emergency fire extinguishing.

Forward of the cargo deck is a main cabin featuring seating for 50 passengers, plus a bathroom, a dedicated luggage area, a storage room, a room for dynamic positioning equipment from Beier Radio, plus a HVAC closet. A generously-sized deck locker accessible from the cargo deck is also integrated into the main cabin.

Above the main cabin sits a wheelhouse featuring forward and aft control stations, with DP controls arranged at the aft station which provides unobstructed views of the cargo deck and offshore structures. Inflatable liferafts are situated outboard of the wheelhouse on each side of the vessel and are easily accessible for rapid deployment in case of an emergency.

Below-deck crew accommodations features five crew staterooms, each with double bunks and lockers, a bathroom, a HVAC closet, galley, pantry and a mess/lounge area. Forward of the crew accommodation lies a bow-thruster compartment featuring two Thrustmaster 30TT200AL tunnel bow thrusters. A series of tanks located between the engine room and crew accommodation have a capacity of 78 433 L of ship's fuel, 166 558 L of transferrable rig fuel, 167 807 L of transferrable rig water, and 9842 L of ship's water.

The engine room includes main propulsion machinery consisting of four Caterpillar 3512C Tier III engines operating at 1425 kW at 1600 rpm coupled to Twin Disc MGX 61000 SC reverse/reduction gears. Each engine drives a four-bladed NiBrAl propeller enabling a top speed of 27 kn and the two inboard engines are also arranged to drive

FFS SFP 250×350 XPC fire-fighting pumps. The generator room houses two John Deere 6090AFM75, 150 ekW generator sets and two John Deere 6090AFM75 auxiliary engines providing power for bow-thruster hydraulic pumps. The steering-gear room features a Beier Radio (Sentinel Controls) steering system to control the two oversized stainless-steel rudders which enhance station keeping and manoeuvrability.

Principal particulars of *Lady Tierney* are

Length OA	62.6 m
Beam OA	10.4 m
Depth	4.50 m
Draft	3.00 m
Passengers	50
Crew	10
Ship's fuel oil	78 433 L
Ship's fresh water	9842 L
Rig fuel oil	166 558 L
Rig fresh water	167 807 L
Sewage	1892 L
Main engines	4×Caterpillar 3512C Tier III each 1425 kW @ 1600 rpm
Propulsion	4×four-bladed NiBrAl propellers
Gearboxes	4×Twin Disc MGX-61000-SC
Auxiliary engines	2×John Deere 6090AFM75 each 242 kW @ 2200 rpm
Bow thrusters	2×Thrustmaster 30TT200AL
Generators	2×John Deere 6090AFM75 each 150 ekW
Construction	Marine-grade aluminum
Flag	USA
Class/Survey	ABS ✠A1 HSC Crewboat Restricted Service OE ✠ AMS ✠DPS-2 USCG Subchapter T

Port quarter of *Lady Tierney*
(Photo courtesy Halimar Shipyard)

43 m Dive-support Vessels from Incat Crowther

Incat Crowther has been contracted to design a pair of 43 m monohull dive-support vessels. The design is an innovative concept comprising the latest ideas from designer, builder, and operator. The design has been developed to meet RINa class requirements for special service, diving, and dynamic positioning.

The vessels are currently under construction at Arpoador Engenharia, in Guarujá, Brazil and will be delivered to Oceanica Offshore for service in Brazil with Petrobras.

The aft main deck features a large working deck, which will house the hyperbaric chamber, dive-bell crane, portside deck crane and ROV crane. Inside the main deckhouse are functional areas including a dive operations office, a workshop, two toilet spaces, laundry room, TV room, lunch room, galley featuring space for large walk-in cooler and freezer, pantry, and dining/meeting room.

Port side of *Lady Tierney*
(Image courtesy Halimar Shipyard)

On the mid deck, the outside cabin features a davit crane for a rescue/work boat, a waste storage area and an anchor winch. Inside the cabin are crew quarters which accommodate 12 crew members. Each stateroom features bunks, desk, lockers and ensuite bathrooms.

The upper deck houses a spacious wheelhouse, with forward- and aft-facing vessel-control stations and a desk wrapping around the stairwell for workspace. Aside from perimeter windows providing 360-degree visibility, overhead windows are also fitted both forward and aft for increased visibility around offshore structures.

Below decks are accommodations for the remaining 24 crew members with six 4-berth cabins. All cabins feature bunks, desks, lockers and ensuite bathrooms. The amidships portion contains a large machinery space housing compressors, pumps, main switchboard and other diving-support equipment. A sizeable engine room and a waterjet compartment are located aft.

Four Cummins QSK-19 main engines, each producing 492 kW, will power the vessels. The vessels will be propelled by four Hamilton HM-521 jets. The waterjet propulsion has been selected to reduce diver risk. Electrical power will be provided by three Cummins QSM 11, 300 ekW gensets plus one Cummins 6BT5.9, 92 ekW emergency genset. Two Rodriquez 150 kW tunnel thrusters provide manoeuvring and station-keeping power. The vessels will have a service speed of 12.5 kn.

Principal particulars of the new vessels are

Length OA	43.0 m
Length WL	40.8 m
Beam OA	9.30 m
Depth	4.25 m
Draft (hull)	2.10 m
Crew/dive personnel	36
Fuel oil	119 400 L
Fresh water	37 800 L
Sullage	6300 L
Main engines	4×Cummins QSK 19 each 492 kW @ 1800 rpm
Propulsion	4×Hamilton HM-521
Generators	3×Cummins QSM 11
Speed (service)	12.5 kn
Construction	Marine-grade aluminum
Flag	Brazil
Class/Survey	RINa C Special Service DYNAPOS-AM/AT R Diving Support, AUT-CCS Unrestricted

Zach Dubois

November 2015

ESSENTIAL MARITIME MANAGEMENT TRAINING PROGRAMS

CONTRACT MANAGEMENT FOR SHIP CONSTRUCTION, REPAIR AND DESIGN

Brisbane, QLD: 4-6 November 2015 (Wed. - Fri.)

Melbourne, VIC: 10-12 November 2015 (Tues. - Thurs.)

Previously attended by nearly 5,000 representatives of 500 organizations from 25 countries.
Accredited by RINA and SNAME.

FISHER MARITIME
Consulting Group

Consulting Naval Architects and Marine Engineers, Project Managers

CONTRACT MANAGEMENT
FOR SHIP CONSTRUCTION, REPAIR AND DESIGN

Training Program Opportunities
November 2015

FISHER MARITIME
Consulting Group

Consulting Naval Architects and Marine Engineers, Project Managers

Dear Colleague:

I am pleased to be able to advise you and your organisation that the well-received 3-day training program, ***Contract Management for Ship Construction, Repair and Design,*** will be available in Brisbane and Melbourne on the dates shown on the front cover of this brochure. These are open registration presentations of the program that has been previously conducted over 400 times world-wide, including 51 times in Australia and New Zealand. Registrations will be limited to about 25 persons per presentation (not more than 12 persons per organisation unless some seats remain available) in order to ensure effective interaction, which is a vital part of the course.

Benefits: This program assists you in defining, understanding and appreciating the most professional manner of managing, controlling, developing and/or using the language of the contract to maximise benefits during ship construction, repair and design. Your participation in this program will assist you by continuing to improve your professional project management skills that are vital to the cost-effectiveness of your work and essential to the long-term success of your organisation.

The benefit of improved contract management is the identification of the pitfalls and traps experienced within the industry. Attendees will be more prepared to identify all the costs and schedule impacts of changes, and to properly assign responsibility for those changes and effects. This will save considerable sums in each major contract. The benefits are estimated at two to three percent of the total value of all contracts managed after the training program.

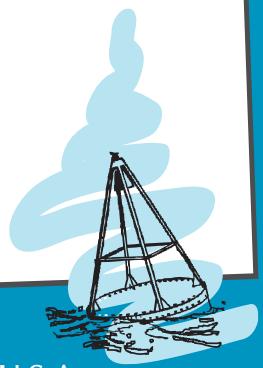
Fees: The open registration fee has been set competitively low in order to give small organizations the economic opportunity to send participants at about the same per-person cost that has been effectively paid by organisations for in-house presentations.

I look forward to having the opportunity to assist your organisation continue to improve the professional skills of you and your colleagues—skills that are vital to the cost-effectiveness of your work and essential to the long-term success of your organisation. Thank you for taking the time to consider this opportunity.

Fisher Maritime Consulting Group

Kenneth W. Fisher

Dr. Kenneth W. Fisher, President



147 Columbia Turnpike, Suite 203, Florham Park, New Jersey 07932 U.S.A.
register@fishermaritime.com • Fax. 001 973 660 1144 • www.fishermaritime.com

Contract Management for Ship Construction, Repair and Design

3-Day Training Program

Day 1
Project Formation Utilizing Principles of Contract Management

- Unique contracting characteristics of the marine industry
- Principles of contract management applied to the marine industry
- Nine case studies on mis-management of ship repair, construction and design
- Analysis of the causes of mis-management
- Chronology of contracts from formation to close-out after the warranty ends
- Meetings and other pre-contract communications which affect contract workscope
- Defining all of the contract deliverables
- Pre-signing contract management, bid package formation, contract development
- Identification of owner's rep's functional responsibilities throughout performance
- Development of spread sheets to track all contract communications
- Shipyard's development of estimate and bid
- Identification of engineering, regulatory and classification-related responsibilities
- Contract signing, pricing review and schedule review
- Project kick-off meeting agenda items
- Advance development of mechanisms to avoid prolonged disputes

Registration Form Page 6

Day 2
Negotiating, Pricing, Scheduling

- Examples of successful and other changes
- How timing affects the cost of changes
- Identification of real change in workscope
- Change work as a substitute for basic work
- Risk assessment and risk syndication
- Engineering and procurement for changes
- Identification of all involved crafts
- Support services for change work
- Obtaining advance pricing commitments
- Limiting negotiation authority for changes
- Hazardous waste removal change orders
- Identifying the non-obvious scope of work
- Credits for canceled or replaced basic work
- Shipyard's vs. ship owner's estimates
- Choosing a negotiator or negotiating team
- Lead times and durations for change work
- Identifying schedule impacts of changes
- Determining delay entitlement for changes
- Competition for change work
- The shipyard's view on indirect costs
- Identifying overlooked billable personnel
- Estimating change's non-productive effects
- Reliance on OFE/GFE commitments
- Dealing with mandatory changes
- Time and material changes
- Identifying/neutralizing negotiating tactics
- Twelve negotiating techniques
- Use of THE CHECK LIST before making commitments

Day 3
Project Control Through Application of Principles and Proven Techniques

- Translating the contract into routine procedures and communications
- Identifying standards for inspection or rejection of workmanship
- Drawings and bills of material
- Classification and Coast Guard approvals
- Schedule development, monitoring and updating—selecting CPN or Gantt
- Delays—excusable, compensable, non-excused and concurrent
- Responding to failures by the other party to fulfill its obligations
- Owner's review of contractor's drawings
- Review of contractor equipment selections
- Owner-furnished information, equipment
- Management of owner's secondary contracts and yard's sub-contracts
- Early identification of potential disputes and their quick resolution
- Inspection deficiency reports—origination and follow-up
- Distributed change order authority
- Warranty and incomplete items
- Vessel delivery and re-delivery procedures
- Financial and insurance matters
- Monitoring contract deliverables lists
- Closing out the contract

Who Should Attend?

- Project Managers (Yards and Owners)
- Contract Managers and Specialists
- Newbuilding Shipyards, Repair Yards
- Fleet Managers
- General Managers of Shipyards
- Financial Managers (Yards & Owners)
- Ship Conversion Specialists
- Naval Architects, Marine Surveyors
- Federal, State and Public Agencies
- Ferry Operators (Public and Private)
- Naval Shipyards
- Owner's Representatives
- On-Site Representatives
- Major Equipment Vendors
- Marine Superintendents
- Consultants, Attorneys

Lessons Learned —Not Theoretical

This program is a lessons-learned one, not some theoretical course on contract management. It bears a lot of "scar tissue" from marine contractual disasters. It is designed for: (a) project managers who handle day-to-day relations with the other party, (b) persons who form contracts, and (c) senior managers who monitor contract-related resources/cash flow.

"This course should be a compulsory part of any training given to project managers moving into the marine industry. I have certainly benefitted from the change management section as this seems to take up a large portion of my working day.'—L.S., Project Manager, New Zealand yacht builder

'I especially benefitted from the actual problems experienced between shipyards and owners. I also appreciated the in-depth discussions on contract language, contractor point-of-view, contractor management philosophies and negotiation/resolution techniques. Excellent presentation. Well done!'—D.S., Canadian Dept. of National Defense

'The course will furnish the tools to allow you to manage your contracts with significant savings to your firm.'—L.U., Fleet Manager, service vessel

'A must for anyone involved (even remotely) with contract management. Dr. Fisher explains the complex elements of contract management very eloquently by using real life examples.'—Z.H., Canadian Navy

'Comprehensive coverage of all aspects of contract management. Beneficial for Contracts, Program Management, and Senior Technical personnel alike. Our Project Engineers learned many practical do's and don'ts.'—J.M., Engineering Manager, major US shipyard

Your Instructor

Dr. Kenneth Fisher is recognized worldwide as the leading authority on the development and management of complex contracts and specifications for ship construction, conversion, repair and design. He is author of the 2004 RINA publication, *Shipbuilding Specifications: Best Practice Guidelines,* and of the 2003 SNAME publication, *Shipbuilding Contracts and Specifications.* As an arbitrator, expert witness, consultant and instructor for more than 36 years, he brings clarity and organization to an otherwise-complex set of management requirements unique to the maritime industry.

Contract Management Training Program

Comments from some prior attendees

The Operator's Perspectives

"The first fresh and rational approach to resolving contract problems, starting with causes and misunderstandings which cost disproportionate amounts of money and time."—N.V., Director, European fleet operator.

"Although I was aware of most of the pitfalls in the overall process of contract establishment and subsequent management, the course's lucid advice provided me with many different concepts, options, and identified the surer way to travel the perilous path. The many anecdotal references illustrated both good and bad practices and the importance of sticking to the basic principles of good preparation and proactive management."—W.R., navy project manager.

"The course provided current policy and pragmatic legal interpretations for conflict resolution. I enjoyed the areas of do's and don'ts of contract negotiation."—L.S.M., ferry operator.

"An excellent balance of very informative material. I feel much more confident in managing a contract. I thought it was the best course I have received while in the Canadian Forces."—A.N., Canadian Dept. of National Defense.

"If you think you know all there is to know about contracting in the marine industry, reserve judgment until you take this course!"—R.O., Canadian Dept. of Nat'l Defense.

"The curriculum touched upon every mistake we made in the past several years, indicating better approaches to solving those problems."—R.B., Project Manager, European fleet operator.

"Great course that makes you look at the contract as a whole whilst still focusing on specific issues that can have great impact. I will be better prepared to manage our contracts from inception to reality."—B.H., N.Z. fishing fleet manager.

"Every topic–without exception–was essential to successful shipyard contract management. Extremely worthwhile."—A.O., ship owner's representative.

"This course should be mandatory for anyone preparing for a new build or upgrade. It was a good refresher for me."—S.H., offshore operator's project manager.

The Contractor's Perspectives

"This training can save a company huge amounts of money which otherwise may have been lost by not understanding a proper business relationship between the owner and the shipyard and the effects of accepting owner's change requests."—S.M., shipyard project manager.

"Most insightful program leading to a better understanding of cost-effective management. I also benefited by listening to other participants sharing their contract problems."—F.G., Project Manager, Canadian shipyard.

"This course is a 'must' for anyone who is involved in contract management. Well structured, systematic approach, supported by endless examples from real life."—T.G., Gen'l Manager, N.Z. custom yacht builder.

"Tremendous overview covering the full spectrum of contract management from pre-contract to post-delivery."—M.G., Ass't Project Manager, major newbuilding shipyard.

"This seminar was an eye-opener. It made me realize how important it was to clear-up contract ambiguities prior to signing."—L.K., Contract Manager, major ship repair yard.

"I benefited greatly regarding the organisation of OFE and OFI. It was very interesting to listen to all the different lessons, taken from reality, in order to avoid those mistakes in the future."—G.W., Exec. Manager, European shipbuilder.

"Excellent seminar. Dr. Fisher's examples and analyses drove home the importance of individual components of the large contract management picture."—B.E., Project Manager, major shipyard.

"Great eye-opener! Dr. Fisher's experience really shows up as he guides you through the jungles of contract misunderstandings."—D.C.R., Project Engineer, major marine vendor.

"For someone in any aspect of the marine business this course should be mandatory. If your attendance was more than 3 years ago, you should attend again."—V.W., shipyard project manager.

"Great benefit to taking course before getting involved with a major contract. Hard to improve."—B.A., Program Manager, major shipyard.

Every 5th Registrant from the same organization is FREE!

REGISTER BY FAX
001 973 660 1144

REGISTER BY MAIL
Fisher Maritime
147 Columbia Tpke Suite 203
Florham Park, NJ 07932

REGISTER BY EMAIL
register@fishermaritime.com
(Do not include credit card information.)

Be sure to indicate the location you will be attending.

All Programs:
8:30 AM to 4:30 PM

See below for special discounts.

TRAINING PROGRAM REGISTRATION FORM

- NOVEMBER 2015 -

FISHER MARITIME Consulting Group

POINT OF CONTACT INFORMATION

Name: _____ Email: _____

Org. Name: _____

Address: _____

City: _____ State/Province: _____ Postal Code: _____

Country: _____ Date: _____

Phone: _____ Fax: _____

REGISTRATION & DISCOUNTS

Registration Fee: _____ No. of Registrants: _____ Team Discount: _____

Early Payment Discount: _____ Total Registration Fee: _____

Contract Management Course:

[ ] Brisbane, QLD: 4-6 November 2015 (Wed.-Fri.) - $1275.00 (AUD)

[ ] Melbourne, VIC: 10-12 November 2015 (Tues.-Thurs.) - $1275.00 (AUD)

BILLING INFORMATION

Form of Payment: [ ] Check [ ] AMEX [ ] Visa [ ] MasterCard [ ] Gov't PO

Cardholder's Name: _____

Cardholder's Signature: _____

Card #: _____

Expiration Date: _____

PAYMENT IS DUE WITH REGISTRATION
(Except for Gov't P.O.s)

10% TEAM DISCOUNT
- AND -
Every 5th registrant from the same organization attends
FREE

ATTENDEES

1) Name: _____ Email: _____

2) Name: _____ Email: _____

3) Name: _____ Email: _____

4) Name: _____ Email: _____

5) Name: _____ Email: _____

6) Name: _____ Email: _____

EARLY PAYMENT DISCOUNT: An $50 discount applies if payment is received at least one month prior to the first day of the program attended by the registrant(s).

TEAM FEE DISCOUNT: A $120 discount per person applies when 2 or more people from the same organization attend the same program, date and city. ON-SITE programs are cost-effective for 10 or more persons.

LOCATION: All programs are held at convenient industry locations. Registrants will be advised of the specific venues.

FEE: The tuition and registrations, payable in advance, is shown above. This includes the cost of all workbooks, program materials and refreshments (luncheons not included).

CANCELLATIONS: All cancellations must be in the form of a written notice. Registrations cancelled at least 14 days before the first day of the program are subject to a $75 cancellation fee. Registrations cancelled 7-13 days before the first day are subject to a $150 cancellation fee. Registrations cancelled 3-6 days before the first day are subject to a $300 cancellation fee. Registrants who do not attend or who cancel less than 3 days before the program will receive copies of program materials but no refund. In the event of a cancellation of a program for any reason, our liability is limited to the return of the registration fee.

TRANSFERS/SUBSTITUTIONS: There is no charge for transfers or substitutions; however, the cancellation policy stated above applies equally.

EMAIL: We recommend you fax this form since we can not guarantee the security of your credit card information when transmitted over email.

THE FLEXIBLE MULTI-ROLE WARSHIP

John Jeremy

The rising cost and complexity of modern warships of all types is driving a trend amongst navies of all sizes towards ships which can either undertake a wide range of tasks or, alternatively, ships which can be adapted at short notice to undertake specific roles but are unable to do everything at any one time. Both types of ship might be regarded as multi-role warships, but the term more correctly describes ships like the RAN's new Hobart-class air-warfare destroyers. These ships will be capable of area command and control, anti-aircraft defence and anti-submarine warfare. They are also expensive and very valuable assets and using the future HMAS *Hobart* for sovereignty patrol duties could accurately be described as 'using a Rolls Royce to squash cockroaches'. Even using the Anzac-class frigates in this role is, at least, employing a BMW for the same purpose.

Ships which are adaptable to different roles depending on the circumstances are flexible warships which, as described recently, employ 'a common hull design adaptable to multiple missions to make tomorrow's Navy flexible, versatile and affordable' [1].

Prior to the Second World War, ships like cruisers, destroyers and sloops had reasonably clearly defined roles and the distinction between ship types was readily apparent. The threat from submarines and aircraft soon resulted in the development of specialised vessels like corvettes and frigates to tackle the submarine threat and escorts with a concentrated anti-aircraft capability, frequently converted cruisers. However, the need to produce large numbers of vessels quickly resulted in the construction of similar hulls with a different emphasis on capability.

Two good examples of the latter are the Loch- and Bay-class frigates of the Royal Navy. In 1942 the design of a new frigate was begun which incorporated the experience with the Flower-class corvettes and the River-class frigates in the Battle of the Atlantic. It was estimated that up to 145 of the new ships would be needed and the design of the Loch class, somewhat larger than the River class, was approved in May 1943. The ships were designed for prefabricated construction, with structural engineering firms contributing to the effort of the selected shipbuilders. The ship's lines were simplified to incorporate straight lines as far as practicable and curves were generally in one direction only. Parts of the ships, like bridges and the superstructure, were fabricated by six of the thirteen yards involved, and wireless offices, sonar and radar spaces were supplied to the builders complete [2].

HMS *Loch Fada* was a typical example of the 28 ships of this version of the World War II design which were completed
(J C Jeremy collection)

The Loch-class frigates were designed for antisubmarine warfare. Twenty eight vessels were completed in this configuration, with another nineteen completed as anti-aircraft frigates — the Bay class. A similar modification was carried out in Australia to the design of the original River-class frigate to create a version with improved anti-aircraft armament, correctly known as the modified River class. Four were completed to this modified design.

HMAS *Murchison* was one of four modified River-class frigates completed in Australia out of a planned 14 ships
(RAN Historical Collection)

Another wartime ship designed for rapid construction was the US-built destroyer escort. Designed to meet a British requirement for a large number of convoy escorts, some 1043 ships had been ordered by June 1943 with most then intended for the US Navy. The design varied depending on the selected armament and the selected propulsion machinery. 563 ships were completed by the end of the war [3]. Some were adapted to serve as fast transports, carrying small numbers of troops for the liberation of Pacific Islands. The conversion, which was very simple, was partly justified to avoid the industrial impact which would have eventuated from the wholesale cancellation of hulls as the battle against the submarine was being won [4].

USS *Weber*, one of 563 destroyer escorts completed in the US during World war II, was built by Bethlehem Steel in four months and six days
(J C Jeremy Collection)

At the end of World War II there were very large numbers of relatively-new destroyers, destroyer escorts and frigates, most of which were consigned to reserve fleets. The frigates all shared one major disadvantage — they were too slow to combat the modern submarine developed during the war which had much higher submerged speed — in particular the German Type XXI and HTP submarines which had a submerged speed of 17 and 24 knots respectively [5].

As early as mid-1943, before the threat from the fast submarine was known, the US and UK were working on the design of a standard class of escort vessel for construction in both countries. The aim was to develop a ship to provide anti-submarine, surface and anti-aircraft protection in a common hull of rather higher speed, around 24 knots, employing steam turbine machinery. This project merged with plans for a new class of sloops, basically a faster version of the successful Black Swan class — versatile ships which had been designed and built to full naval standards.

By early 1945 the versions of the new ship had grown in number to include an aircraft direction and convoy escort headquarters ship. In November 1945 the UK government approved the construction of two ships — one anti-submarine version and one anti-aircraft version. Designing a common hull for all the versions proved to be problematic as the displacement of the different versions grew. The possibility emerged that a slower ship would suit the anti-aircraft and aircraft-direction ships with a faster ship for the anti-submarine version. By early 1947 diesel propulsion was accepted for the former ships with steam turbines for the latter, larger ship.

HMS *Salisbury*, a Type 61 aircraft-direction frigate completed in February 1957
(J C Jeremy Collection)

The common hull concept was retained for the diesel-powered frigates which became the Leopard class (Type 41) and the Salisbury class (Type 61). The design of the anti-submarine ship was delayed by the need for design resources to be devoted to the conversion of surplus wartime destroyers to anti-submarine frigates to meet the urgent need for ships to combat the threat from high underwater speed submarines. Moreover, the requirements changed further as the need for greater speed and endurance emerged. The sketch design for the ship, which became the well known and very-successful Type 12 anti-submarine frigate, was approved in February 1950 [6]. Subsequently developed into the Leander class, some 70 ships of this basic design were ultimately built.

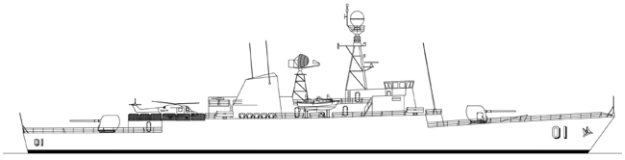
The design of these new classes was intended to produce a series of warships which could be rapidly built throughout the Commonwealth by builders who were not necessarily used to warship construction. In 1947 the British Admiralty had surveyed shipyards in the Dominions to select those which might be suitable for the rapid construction of warships in the event of a future war with the Soviet Union. In the event, the new frigates proved to be far from simple to build. The longitudinal construction method adopted for the Type 41 and Type 61 frigates, with very closely-spaced longitudinals, proved to be very challenging, even for the naval shipbuilders who built them. The Type 12 hull was slightly less complex, but not much. Early plans had proposed that complex spaces, like operations rooms and other electronic compartments, might be built by specialist firms away from the waterfront and shipped largely complete. This did not prove to be practicable and the frigates took longer and were more costly to build than originally expected.

The idea of using a common hull for similar ships fitted out for different primary roles persisted into the 1960s. A good example is the Australian Light Destroyer. The DDL was originally conceived in 1966 as a result of experience during the Malaysian/Indonesian confrontation. The need was then

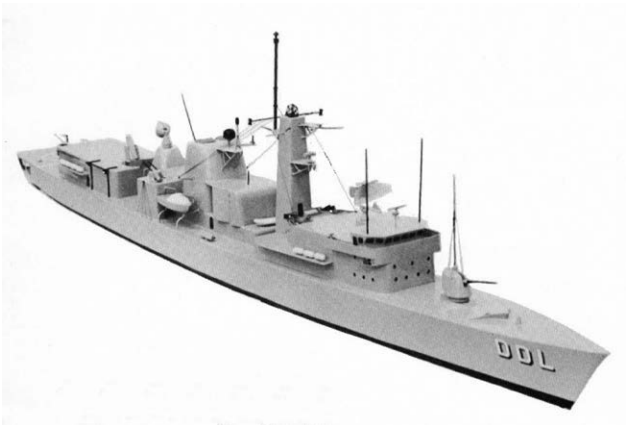
HMAS *Yarra*, completed by Williamstown Naval Dockyard in July 1961, was one of six Type 12 frigates built in Australia for the RAN. The ships were completed as three distinctly different pairs between 1961 and 1971
(RAN Historical Collection)

seen for some 20 fast, simply-armed ships to back up the destroyer force [7]. The possibility of producing variants of the design in a common hull of about 1700 t was seen to be an advantage. In 1967, discussions were held with the Royal Navy to see whether the proposed ship might be suitable for both navies but there were too many differences in requirements, in particular the RAN preference for US weapons and electronics, to make a single design practicable. The RAN withdrew from the joint project in November 1968 and the RN ship ultimately became the Type 21 Frigate [8].

A design study for the DDL was undertaken by Y-ARD during 1967, by which time the size of the ship had grown to around 2200 t displacement, and the planned number of ships had fallen to six. Y-ARD completed a preliminary design in 1970. The ship had grown further into a large, very capable general-purpose destroyer of around 4200 t to replace, rather than supplement, some of the existing destroyer fleet, and the number had fallen to three. The project was cancelled in 1973.



The profile of the Australian light destroyer (DDL) in 1968. The ship had already grown in size from the original concept
(J C Jeremy Collection)



By early 1973 the DDL had grown into a large general-purpose destroyer. The project was cancelled later that year
(RAN)

The rapid growth in the development of sonar, radar and fire-control systems which occurred during World War II and in the years thereafter drove the increasing complexity of the ships built in the early decades after the war. Equipment was generally integrated into the ship, rather than simply placed on board. The quantity of electrical cabling grew considerably and air-conditioning and chilled water systems became mandatory to remove the heat generated by the electronics. Outfit times became protracted as the work occupied many manhours in cramped spaces.

A good illustration of the type of effort then required is the Australian Ikara anti-submarine missile installation in the Australian Type 12s. The magazine and handling system for this weapon was effectively built into the ship — rather than being a component which was placed in the ship. The ship's structure provided the support for the hangers and rails which were mounted directly on the overhead structure of the magazine or on the deck in the handling room. The tolerances on levels and heights were very tight, and for the first installation some 360 spacers, or pads, had to be individually measured and manufactured to mount the equipment. Considering just how much a small ship like a Type 12 frigate moves and bends in a seaway, or even when the sun goes behind a cloud, it is remarkable that the system actually worked!

The handling equipment for the Australian Ikara anti-submarine guided missile was closely integrated into the RAN Type 12 frigates and installation was time consuming
(RAN Historical Collection)

Other early missile systems were similarly challenging for shipbuilders, both in UK and US designs. The British County-class destroyers were, for example, virtually designed around the handling equipment for the Sea Slug missile. The US Navy's Talos system also consumed a large part of the ship and was effectively built into the structure. By contrast, the US GMLS 13 magazine and launcher which was fitted in our DDGs and FFGs is a self-contained unit shipped in one piece.

The County-class destroyer HMS *Devonshire* arriving in Sydney in 1968. The Sea Slug magazine and handling spaces occupied a large proportion of the ship on No 2 deck — as far as the forward funnel
(J C Jeremy photograph)

Clearly, something had to change. Whilst the complexity of the ships designed after World War II grew rapidly, the development of their weapons and sensors had continued at an even greater pace. It takes about ten years to get a modern frigate from start of design to start of production. When the ship is customised around a particular weapons fit, the

combat system is likely to be at least fifteen years old by the time the first ship is delivered. Combat system technology will have advanced considerably but the custom-designed warship has a further life of 25 to 30 years. Modernising such a ship is a complex, difficult and very costly task, as the new-generation combat system is likely to require extensive changes to mechanical, electrical, ventilation and hydraulic systems, and changes to the ship's structure.

One approach is to design a simpler warship which could be expected to be replaced after a relatively short life, say ten to fifteen years, rather than extensively modernised. The reality is, however, that getting approval from a government for a new ship is much more difficult than getting approval to change an existing ship, particularly if the existing ship clearly has considerable remaining hull life.

During the 1970s and 1980s, changes in shipbuilding through the widespread use of computers in production helped to enable block construction techniques and greater standardisation between ships, providing the opportunity for a new way to accommodate different combat systems with less-dramatic change in basic ship design. Work began in several countries on modular construction systems which could simplify warship construction.

In the United States a program called SEAMOD (SEA systems modification and modernisation by MODularity) was begun in 1975. The concepts developed then showed that it was possible to simplify the acquisition, construction and modernisation of warships by using modularised system components which could be developed and built in parallel with the ship. The use of standard interfaces and hardware also could simplify maintenance and modernisation — modules could simply be changed as necessary [9].

It took some time for these concepts to be adopted. Whilst modularity makes a great deal of sense for cars which are built in their thousands, and aircraft also built in large numbers, warships are usually built for a particular mission and in small numbers. The adoption of modular components, particularly large ones like combat system elements, also requires more-complicated structure to mount the modules which increases hull mass. The modules themselves use extra material and add mass, all contributing to additional costs which might be seen to outweigh the benefits. Also, there is little benefit to be gained from an ability to exchange a faulty module with a fully-serviceable one if suitable spare modules have not been acquired and kept ready for service, a provision which could prove costly and hard to justify.

The process of change finally began in Germany. In the late 1970s, Blohm & Voss developed their MEKO concept of modularity. The MEKO system is based around their patented functional unit, which can contain a gun, missile system, air conditioning plant, or even an electronic space, which might comprise one or more functional units.

Despite the mass penalties with this system, there are obvious advantages. The functional units can be constructed away from the shipyard in ideal conditions and fully completed and set to work before delivery for installation in the ship. Generally, the latter operation simply involves bolting the unit in place and connecting the ship's services — what we would call in the computer world of today 'plug and play'. During refit and modernisation the functional units can be easily removed and replaced at a fraction of the cost of changing equipment which has been built into the ship. Blohm & Voss estimated that the system can save up to 10% of production costs and reduce the production schedule by 25%.

The Anzac-class frigate HMAS *Ballarat*
(J C Jeremy photograph)

The Royal Australian Navy Anzac-class frigates are MEKO ships, and warships built in this way have now been built for many navies around the world, including the German Navy. Since 1981 some 70 MEKO warships have been built or are under construction.

Similar concepts have been adopted by other countries. The Royal Danish Navy's StanFlex system was developed in the early 1980s as a way to replace several classes of small warship with a single class of multi-role ship in which standardised containers can be fitted into slots in the ship to suit particular mission requirements [10]. Equipment common to all the ship's roles is built into the ship. Studies during 1983 and 1984 led to the design of the Standard Flex 300 ship — 54 m long, 300 t patrol vessels which were fitted with one StanFlex slot forward and three aft. Fourteen ships were built by 1996, replacing 22 previous ships, but the vessels actually remained single role and they were decommissioned by 2004 and subsequently sold.

It is said that StanFlex modules could be exchanged within half an hour, with the ship ready to deploy within a few hours after system testing — assuming, of course, that qualified and trained crew were available. The StanFlex system slots have been installed on older vessels during refits and, by 2012, nine ship classes were in service capable of carrying mission payloads in StanFlex modules. StanFlex modules have been manufactured for Harpoon and Sea Sparrow missiles, the Otobreda 56 mm gun, launchers for M90 torpedoes, sonar, command-and-control equipment, mine-hunting equipment and hydraulic cranes.

The Danish frigate *Iver Huitfeldt*, completed in 2012, has four Stanflex container slots
(fdra-naval.blogspot.com.au)

Whilst this kind of modular payload design clearly has many attractions, successful application in practice depends on having a ship design which is capable of supporting the various payloads throughout the life of the ship. The ship designer has to ensure that the power generators, power distribution systems, air and water services all have sufficient capacity to support changing demands over time. Accommodation also needs to be provided for the crew to support and operate the different payloads. The adoption of a modular payload system does not relieve the ship designer of the need for 20–20 foresight to anticipate the service requirements of combat systems up to several decades ahead — a familiar challenge for warship designers. Similarly, combat system development is constrained by the need for it to be accommodated in standard modules.

Despite the success of systems like MEKO and StanFlex, navies continue to pursue traditional ship-design concepts whilst still incorporating flexibility to enable a common hull to be constructed in different variants. Examples include the French/Italian FREMM multi-purpose frigate, designed by DCNS/Armaris of France and Fincantieri of Italy. France is building six ASW variants and two air-warfare variants, and Italy is building eight, four ASW and four general-purpose variants. One has been sold to Morocco [11].

The British Type 26 frigate — the 'Global Combat Ship' — is another example of a ship designed for payload flexibility. Thirteen ships are to be built for the Royal Navy, a mix of anti-submarine and general-purpose versions. The design will incorporate some modular payload capability.

The decision by the Australia Government to spend about $78 million to study the practicability of adapting the design of the Hobart-class destroyer to suit the future frigate requirement is another example of seeking to reduce design overhead and maximise production efficiencies by using a common hull for different missions over a prolonged period. The obvious advantages of this approach include simplified training and logistic support through life, but this must be set against progressive obsolescence of ship systems and equipment.

One of the most interesting, and controversial, projects to build a flexible, modular-payload ship is the US Navy's Littoral Combat Ship (LCS) programme. The programme was announced in November 2001, and it is intended to provide the US Navy with a 'relatively inexpensive' surface warship equipped with modular 'plug and fight' mission packages, including unmanned vehicles. Not a multi-mission ship, the LCS is intended to be a focussed-mission ship, capable of performing one primary mission at any one time.[12]

The primary missions for the LCS are ASW, mine countermeasures, and surface warfare against small craft, primarily in near-shore (i.e. littoral) waters. There are many subsidiary missions, including peacetime engagement and partnership-building operations, intelligence, surveillance and reconnaissance, anti-piracy, support of special forces and homeland defence.

The LCS was designed as a smallish ship (about 3000 t displacement), with a shallow draft and a maximum speed of 40 kn.

In May 2004, two contracts were awarded for the design of two competing versions of the LCS. One industry team was led by Lockheed Martin, and one by General Dynamics, the latter team including Australia's Austal through their US subsidiary company. The two designs are quite different. The Lockheed Martin team's ship is a steel semi-planing monohull (with an aluminium superstructure) and the General Dynamics ship, designed by Austal, is an all-aluminium trimaran based on Austal's high-speed trimaran ferry design. Both ships have different combat systems.

Whilst the original intention was to build four prototypes and then select one design for series production, the second two prototypes were cancelled and both competitors finally won — the LCS are being built to both designs.

The ships are being built by Austal USA at their shipyard in Mobile, Alabama, and by Marinette Marine (a subsidiary of

USS *Independence* (LCS 2) and USS *Coronado* (LCS 4)
(US Navy photograph)

Fincantieri of Italy) at their yard at Marinette, Wisconsin. The prototype ships were completed by 2010. The first was LCS 1, USS *Independence*, completed on 8 November 2008 and the second USS *Freedom* (LCS 2) was completed on 16 January 2010. The first production trimaran was completed on 6 August 2012 and the first production monohull was completed on 27 January 2014.

Both designs of LCS employ extensive automation to reduce the size of the crew. The original aim was to have a core crew of 40, but that has since been increased to 50. About 38 additional sailors are required to operate the embarked aircraft (23) and an embarked mission package (15), which makes a total crew of about 88 sailors.

The US Navy plans to maintain three LCS crews for each two ships, and to keep one of those two ships continuously underway. Under this plan, the LCS are intended to be deployed for 16 months at a time with crews rotating on and off the deployed ships at four-month intervals. Four ships are planned to be forward based at Singapore and eight at Bahrain.

The LCS programme has not been without problems. The original unit cost (for the ship, not including mission

USS *Fort Worth* (LCS 3) during builder's trials on Lake Michigan
(US Navy photograph)

packages) was expected to be about $US220 million in 2005 dollars; however, the actual cost of the first few ships more than doubled. Costs under bulk-buy contracts subsequently dropped to about $US450 million in today's dollars, about $US380 million in 2005 dollars.

The development of mission packages has also had some problems and has taken longer than planned. The US Navy is buying 23 mine-countermeasure packages (at $97.7 million each), 21 surface warfare packages (at $32.6 million each), 15 anti-submarine packages (at $20.9 million each) and 59 sets of common-mission equipment packages (at $14.8 million each). Since January 2011, changes have been made to all three mission packages as equipment selections have changed, partly driven by equipment cancellations imposed by financial limitations.

The LCS programme has been controversial due to the cost growth, design and construction issues with the lead ships, concern over the ships' ability to withstand battle damage, and concern over whether the ships are sufficiently armed and able to do their stated missions effectively. The US Navy has acknowledged some problems and argued that it was taking corrective action, and has disputed other arguments against the program. Of course, the LCS is far from being the only US Navy program to suffer controversy and criticism. The *Gerald R Ford* (CVN 78) class aircraft-carrier program and the *Zumwalt* (DDG 1000) class destroyer programme have been heavily criticised for high cost and technical risk. Time will tell, I expect. Historically, the patrol frigate (FFG 7) class, of which Australia bought six ships, was heavily criticised in its time as being an inadequate and under-armed ship but, today, that class is regarded as the benchmark for future US surface combatants and some have even proposed building a modern version in preference to the LCS.

HMAS *Melbourne*, an Australian-built FFG 7 class frigate. When first designed, these ships were regarded by some as inadequate and under-armed but have recently regarded as a benchmark for future frigate designs
(RAN photograph)

Originally the US Navy intended to buy 52 LCS — 26 of each design. In April 2014 the US Navy informed the US Senate Armed Service Committee that:

"While the Navy continues to focus on the merits of LCS and the capabilities which it brings to the fleet, the service also recognises the importance of maintaining awareness of emerging threats and capabilities of our Nation's adversaries. As a result, the Navy is examining options to increase the lethality of our small surface combatant force. Specifically, the Navy is studying existing ship designs (including the LCS), a modified LCS, and a completely new ship design, including their estimated cost, to determine the most-affordable method for improving the capability of this critical element of our force. Pending the results of this study (due in support of FY 2016 budget formulation), the Navy will restrict LCS contract actions within the first 32 ships of the class."

Design, construction, trials and acceptance of a modern warship is a protracted and very costly exercise. With pressures on defence budgets, the need for more commonality amongst fleets and cooperation between nations is being frequently discussed in professional journals. For example, it had been suggested that the follow-on to the LCS should be a proven modern frigate design like the Danish *Iver Huitfeldt* (a StanFlex ship) or the French/Italian FREMM [13].

The US Navy study concluded, however, that the most-affordable option was to upgrade the capability of the existing LCS designs to produce a ship which, whilst still multi-mission focussed, had expanded surface-warfare and anti-submarine warfare capabilities and improved survivability. Modifications to the existing LCS designs will include additional weapons systems and combat systems upgrades. The ships will retain some aspects of modularity but will focus on their SUW and ASW capabilities. The study also concluded that modifying the LCS would help maintain industrial infrastructure with no breaks in production and optimise total ownership cost.

The new ships, which have now been reclassified as frigates, will have an increased displacement as a result of the changes, with a consequent reduction in top speed. It will also be necessary to reduce the displacement of the existing designs to accommodate the changes. The frigates, which will comprise the last 20 ships of the class, are expected to cost about $60 to $75 million more than the LCS [14].

Meanwhile progress continues to be made introducing the existing LCS into service. USS *Freedom* was deployed last year to the Western Pacific, a deployment which helped to generate considerable international interest in the LCS concept and design, and USS *Independence* took part in RIMPAC 2014 at short notice. *Independence* had been employed in San Diego testing the mine-warfare mission package and was given two weeks notice of her participation in RIMPAC. The change in her plans required the off-

The Remote Minehunting System and an AN/AQS-20 mine hunting sonar being brought aboard USS *Independence* during developmental testing of the mine-warfare mission module package
(US Navy photograph)

loading of the MCM package, the embarkation of a surface warfare package with 19 sailors, two 30 mm guns, a couple of 11 m RIBs and an aviation detachment with two MH-60S helicopters. The packages were transferred in 96 hours. It was also necessary to test many systems, including the 30 mm guns, which had not been used in her four years of service. That work was completed en-route to Hawaii, along with the full commissioning of the ship's combat system.

More recently, the second of the Independence-variant LCS, USS *Coronado* (LCS 4) has completed a Combat System Ship Qualification Trial including firing of her 57 mm gun against a fast attack craft as part of the lead up to the Technical Evaluation and Initial Operational Testing and Evaluation of the surface-warfare mission package in 2015 [15].

The development of the mission modules for the LCS continues to present challenges. The ASW mission package is too heavy, an anticipated consequence of using existing, proven equipment in the package, and contracts have recently been placed to investigate ways in which the mass might be contained within the limit of 105 t. Acceptance of the mine-warfare mission package has also been delayed because of reliability issues.

Whatever the final outcome for the LCS modular mission package concept, ship designs with operational variants are becoming more common.

Closer to home, the 2009 Defence White Paper included a Government plan for Defence to develop proposals to rationalise the RAN's patrol boat, mine counter-measures, hydrographic and oceanographic forces into a single multi-role class of around 20 Offshore Combatant Vessels combining four existing classes of vessels into a single hull of around 2000 t. This future offshore combatant was to be able to undertake offshore and littoral warfighting roles, border protection tasks, long-range counter-terrorism and counter-piracy operations, support to special forces and missions in support of security and stability in the immediate neighbourhood and would probably have embarked a helicopter or UAV [16].

The Defence White Paper of 2013 scrapped this plan, stating: 'A modular multi-role vessel remains a possible longer-term capability outcome, subject to technological maturity and an ability to provide operational flexibility with lower costs of ownership. However, in the shorter-term, Government will seek to replace the current Armidale-class patrol boats with a proven vessel to ensure that Defence can continue to provide a patrol capability. Similarly, Government intends to upgrade and extend the existing Mine Hunter Coastal and Survey Motor Launch Hydrographic vessels until the longer-term solution can be delivered [17].'

Considering the many challenges facing the RAN and the Department of Defence in managing current and future projects, this change of heart is perhaps understandable. The Defence White Paper of 2015 is expected to reveal more about of the shape of future RAN ships, but it is highly likely that the future will include some ships with modular payloads, if the trends evident overseas are a guide.

The flexible multi-role warship, is that the way of the future? Adoption of the flexible modular-payload design concept requires consideration of much more than ship design. For example, a modular payload securely maintained at HMAS *Waterhen* in Sydney is of little use to a ship which needs it, if that ship is in the Persian Gulf. Design of these future systems must include consideration of complex logistics including air-transportable modular payloads. However, given the potential benefits, it is probable that increased mission flexibility with modular payloads will be a feature of many future warship designs.

References

1. Smidt, M. and Junge, M. (2014), 'A Modular Warship for 2015', *Proceedings*, US Naval Institute, January, p.28

2. Brown, D. K. (2007), *Atlantic Escorts: Ships Weapons and Tactics in World War II*, Seaforth Publishing, England, pp. 120–126.

3. Franklin, B. H. (1999), *The Buckley-class destroyer escorts*, Naval Institute Press, Annapolis, Maryland.

4. Friedman, N. (1982), *US Destroyers — an Illustrated Design History*, Arms and Armour Press, UK, pp. 150–157.

5. Rössler, E. (1981), *The U-boat*, Arms and Armour Press, London, pp. 340-341.

6. Brown, D. K. and Moore, G. (2003), *Rebuilding the Royal Navy: Warship Design since 1945*, Chatham Publishing, London.

7. Loxton, B. H. (1972), 'DDL — The Concept Develops', *Navy Quarterly*, Department of the Navy, Canberra, Volume 1 No. 4 (October), p. 12

8. Friedman, N. (2006), *British Destroyers and Frigates: The Second World War and After*, Seaforth Publishing, Barnsley, UK, pp. 292–295.

9. Smidt and Junge, [1].

10. http://en.wikipedia.org/wiki/StanFlex accessed on 27 August 2014.

11. Saunders, S. (Ed.) (2014), *Janes Fighting Ships 2014–15*, IHS Global, Coulston.

12. O'Rourke, R. (2014), *Navy Littoral Combat Ship (LCS) Program: Background and Issues for Congress*, 4 August 2014, Congressional Research Service, www.crs.gov.

13. Pagenkopf, C. (2014), 'Cooperation is the Key to NATO's Future', *Proceedings*, US Naval Institute, September, p. 69.

14. O'Rourke, R. (2015), *Navy Littoral Combat Ship (LCS)/ Frigate Program: Background and Issues for Congress*, 12 June 2015, Congressional Research Service, www.crs.gov.

15. US Navy press release 5 September 2015

16. *Force 2030, Defending Australia in the Asia Pacific Century*, (Defence White Paper 2009), Department of Defence, Canberra, p. 73

17. *Defence White Paper 2013*, Department of Defence, Canberra, p. 84.

Operational Risk Profiling — A Risk-based Approach to Acquisition and Through-life Support

Jesse Millar
BMT Design & Technology Pty Ltd

With the upcoming replacement of HMAS *Sirius* and HMAS *Success*, it is important to consider the previous issues and challenges encountered in Defence acquisition and sustainment projects. The objective in moving forward must be to ensure that risks identified and realised in the past are not repeated, and that effective mitigations are in place for the whole of lifecycle of the replacement ships. Past problems have been highlighted most recently by the reviews of Mortimer, Rizzo and Coles, which all point to sustainment failings which prevented stakeholders from adequately identifying and addressing the risks to achieving operational objectives. This can be only achieved by ensuring that mitigation is effectively implemented at the acquisition phase and managed throughout the whole of the life cycle.

It is essential that stakeholders focus on operational objectives throughout the acquisition and look at the physical material as only one piece of capability required to achieve the desired objectives. By taking a risk-based approach to the acquisition and through-life sustainment, and developing an Operational Risk Profile (ORP), associated risks in achieving the operational objectives can be identified. This approach ensures that, within each step of the acquisition phase, the necessary mitigation measures are in place and are effectively managed throughout the whole of the life cycle.

The ORP provides stakeholders with the medium they require to make objective based decisions about the acquisition and through-life sustainment, both technically and financially. Through this process there should be no unplanned, or at least substantially reduced, expenditure as budgets are fully justified against each line of mitigation.

For the ORP to be fully effective, all eight Fundamental Inputs to Capability (FIC) must be addressed, identifying the risks arising from organisation, personnel, collective training, major systems, supplies, facilities and training areas, support, command and management. In essence, the ORP seeks to identify any risk which may prevent the operator from achieving his assigned operational objectives. Many of the risks identified will be mitigated through existing defence practices but, nevertheless, they all need to be reviewed to ensure that current practices are equally applicable to the new acquisition.

The Armidale-class patrol boat (ACPB) fleet is an excellent example of where the acquisition process did not adequately address all of the associated risks and, in turn, not all operational objectives were met. The vessels were procured from a commercial shipyard, are managed by a commercial company under commercial ship classification, yet owned and operated by the Navy, on a rotational crewing basis. This is a feasible acquisition and operational model but it required a level of risk management which did not appear to be evident. Remedial programs have taken place to rectify the issues, but failure to fully develop and mitigate the risks identified through a process such as the ORP remains an ongoing concern for the vessels.

In developing the ORP, stakeholders must look to the whole of the life cycle of the platform. For the replacements of HMAS *Sirius* and HMAS *Success*, the basic operational objective is to provide a replenishment-at-sea (RAS) capability for the RAN. Considering the FICs, it is important to consider outside factors, such as the current shortage of operators and maintainers within in the mining sector and the possible resultant pull of skilled personnel from the Defence force and contracted support organisations. Also, the increasing environmental legislation which is imposed by the International Maritime Organisation (IMO), requiring better ship efficiency, compounded by the increasing cost of diesel.

It is expected that the majority of risks which will be identified are not unique and, through the process of developing an ORP that helps the operator to identify all of the risks which may affect his ability to achieve his operational objectives, effective mitigation that is already in place, or has been used before, can be implemented. This will include documented organisational systems and processes, training and shore-support facilities and organisations. Where this is not the case, then innovative solutions will need to be defined through the critical baselines of operation, maintenance and configuration. This will require a risk based approach with extensive stakeholder engagement.

Ultimately, the total cost of ownership will be derived from, and justified against, the risks identified in the ORP, which provides stakeholders with an objective basis on which to found their technical and financial decisions. An early component of the ORP is a risk-based trade-off between the investment and the subsequent operational objectives.

When the ship enters service, the ORP provides the operator with a tool to ensure that the risks in achieving his operational objectives are as low as reasonably practicable throughout the whole of the life cycle of the operations, providing stakeholders with assurance that the platform is safe, environmentally compliant, and fit for service.

When times are tough, it does not mean that we do less, but that we do more with what we have. For the replacement of HMAS *Sirius* and HMAS *Success*, stakeholders should seek to develop an effective ORP which allows progressive risk mitigation through existing tools and processes, minimising unnecessary expenditure during acquisition and through-life support.

EDUCATION NEWS

Australian Maritime College

AMC Principal among the Nation's Top Engineers

Australian Maritime College Principal, Neil Bose, has been named one of the top 100 most influential engineers in the country by Engineers Australia.

Professor Bose has earned an international reputation for marine propulsion research over the course of his 37-year career and continues to play a leading role in innovative engineering projects at AMC, a specialist institute of the University of Tasmania.

"I am honoured to be named alongside such esteemed company as one of the top 100 most influential engineers in Australia. This recognition is wonderful for AMC and the University and has resulted largely because of this role — it is as much about the position as it is the person," he said.

Professor Bose points to his role at AMC's helm, in which he is responsible for developing close ties with industry and promoting the college's maritime training programs and specialist research facilities, as a career highlight.

"Research is important, but we focus on research that is very applied — nearly all of our projects are led in conjunction with industry," he said.

"At the leading edge side, we are working on designing and operating the next generation of autonomous underwater vehicles as part of the Antarctic Gateway Partnership; and we are researching the design and sustainment of our future defence vessels as part of the ARC Training Centre for Transforming Australia's Naval Manufacturing Industry."

Professor Bose holds a bachelor's degree and PhD in naval architecture and ocean engineering from the University of Glasgow.

Born in the United Kingdom, he started his working life combining his two major interests in boats and design as a partner in the Cape Wrath Boatyard, where he built wooden and fibreglass vessels.

In 1983, he took up a lecturing position in naval architecture and ocean engineering at the University of Glasgow. Professor Bose moved to the Memorial University of Newfoundland, Canada, in 1987, where he held several senior academic roles including a Canada Research Chair in Offshore and Underwater Vehicles Design.

He joined AMC in May 2007 and was soon appointed Director of the National Centre for Maritime Engineering and Hydrodynamics, before taking up the post of Principal in 2013.

His other research interests include autonomous underwater vehicles, ocean environmental monitoring, ocean renewable energy, ice-propeller interaction and aspects of offshore design.

AMC Principal Professor Neil Bose has been named one of the Top 100 Most Influential Engineers in Australia by Engineers Australia (Photo courtesy University of Tasmania)

AMC Fast Boat Design Recognised on International Stage

A team of maritime engineering students from the Australian Maritime College at the University of Tasmania has had their boat design skills recognised for the second year running at the HYDROcontest at Lake Geneva, Switzerland.

The event saw 150 students from 16 universities around the world vie for the title of fastest and most energy-efficient boat. The countries represented were France, Switzerland, Brazil, Sri Lanka, United Kingdom, Malaysia, Colombia and Australia.

Although the eight-member AMC crew did not make it through to the finals, they were pleased to achieve a podium finish with the best boat design.

"Unfortunately we didn't make the finals due to various electronic issues, but we were recognised by the officials for our efficient and aggressive design which achieved the highest recorded speed of 25.4 km/h," team leader Mitchell Pearson said.

"This is exciting for us as we believe that it is capable of going even faster with a bit of fine tuning. We've built a boat which is capable of competing at the top level of the contest for years to come. It's been an amazing competition and all those involved have had an absolute blast."

Team AMC competed in both the lightweight and heavyweight divisions using an innovative two-in-one design concept that used the same hull with different underwater kits to suit the respective categories.

The lightweight boat was a foiling catamaran and the heavyweight boat used a SWATH (small water-plane area twin-hull) set-up, with two submarines joined together like a catamaran.

This year's outcome builds on the success of the inaugural team which was awarded the best technology prize and came second in the long-distance race at last year's HYDROcontest.

The race is run by the HYDROS Foundation and focuses on the development of technologies that increase the energy efficiency of the vessels of tomorrow and reduces dependence on fossil fuels. It aims to showcase research and innovation in the area of maritime transport through a series of three challenges: a heavyweight transport vessel which must race with 200 kg of cargo, a lightweight vessel racing with a load of 20 kg, and a long distance race to determine the most energy-efficient vessel design.

Team AMC receive the Best Boat Design award at the 2015 HYDROcontest in Switzerland. (L to R) James Wilkes, Reuben Kent, Mitchell Pearson, Will Innis, Sam Smith, Alex Waterhouse, Dave Carlsson and Sam Hunnibell
(Photo courtesy University of Tasmania)

University of New South Wales

Undergraduate News

Inclining Experiment

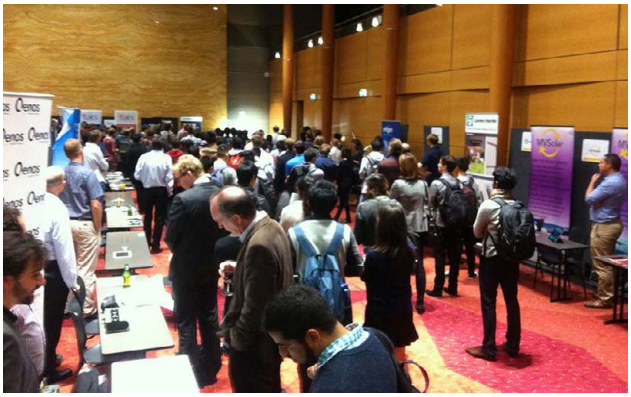
Sydney Heritage Fleet provided access to their 50 ft (15.24 m) tug *Bronzewing* for the third-year students to conduct an inclining experiment at Rozelle Bay on 6 May. The students conducted the experiment with the guidance of lecturers David Lyons and Phil Helmore. The day was good for an inclining; fine and sunny, with a 5–10 kn breeze the whole time. The made a good fist of their first inclining. The theory of stability is fascinating, but seeing it in practice at an inclining makes it come *to life* for the students.

UNSW inclining crew
Back: Alistair Smith, David Lyons, Brett Ryall
Front: Jiong Wang, Geoffrey McCarey, James Johnston, Thales Lobato, Bernardo Bessone
(Photo Phil Helmore)

Students-meet-Industry Night

The annual Students-meet-Industry night, organised by MechSoc (the school's student society) was held on 19 May. Sam Foster and John van Pham came and talked to the Year 3 and 4 students about opportunities for industrial training and employment at Incat Crowther.

The evening was complete with a range of finger foods (party pies and quiche, sausage rolls, chicken drumsticks, mini-burgers, samosas, pakoras, etc.) and drinks (beer, wine, orange juice and soft drinks).



Students-meet-Industry night and welcome by Head of School (behind bright lights!)
(Photo Phil Helmore)

Graduation

At the graduation ceremony on 12 June, the following graduated with degrees in naval architecture:

Thomas Boddy	Honours Class 2 Division 2
Yang Du	
Pranjal Gupta	Honours Class 2 Division 2
James Heydon	Honours Class 2 Division 1
Dauson Swied	Honours Class 1 and the University Medal
Lucy Xu	Honours Class 2 Division 2

Dauson Swied's University Medal deserves special mention. The medal is awarded for a weighted average mark for all subjects in all years of the degree course (weighted more heavily towards the later years) of 85% or more. To put this in perspective, of our 358 graduates in naval architecture, 75 have been awarded Honours Class 1, and just 12 have been awarded the University Medal.

Tom Boddy, Phil Helmore, Dauson Swied, James Heydon and Pranjal Gupta
at the UNSW Graduation Ceremony on 12 June
(Photo courtesy Tom Boddy)

Prize-giving Ceremony

At the prize-giving ceremony on the same day, the following prizes were awarded in naval architecture and announced by the Head of School, Prof. Anne Simmons:

The Royal Institution of Naval Architects (New South Wales Section) Prize 1 for the best performance by a student in Year 1 of the naval architecture degree program to Gian Maria Ferrighi.

The Royal Institution of Naval Architects (New South Wales Section) Prize 2 for the best performance by a student in Year 2 of the naval architecture degree program to Jiong Wang, presented by the Chair of the NSW Section of RINA, Alan Taylor.

The Royal Institution of Naval Architects (New South Wales Section) Prize 3 for the best performance by a student in Year 3 of the naval architecture degree program to Alistair Smith, presented by the Chair of the NSW Section of RINA, Alan Taylor.

The Royal Institution of Naval Architects (Australian Division) Prize and Medal for the best ship design project by a student in the final year to James Heydon for his design of a high-speed monohull ferry to carry 285 passengers operating out of Port Douglas, Queensland, presented by Phil Helmore.

The David Carment Memorial Prize and Medal for the best overall performance by a student in the final year to Dauson Swied, presented by Phil Helmore.
Congratulations to all on their fine performances.

Graduates Employed

Our 2015 graduates are now employed as follows:

Thomas Boddy	Department of Defence, Sydney
Yang Du	Masters of Business degree, University of Wollongong
Pranjal Gupta	Euro Solar, Sydney
James Heydon	Directorate of Navy Platform Systems, Canberra
Dauson Swied	One2three Naval Architects, Sydney
Lucy Xu	Singtong Marine & Offshore, Nantong, China

Thesis Topics

Among the interesting undergraduate thesis projects completing or newly under way are the following:

Anne Simpson, Jiong Wang and Phil Helmore at the presentation of the RINA (NSW Section) Prize for Year 2 Naval Architecture
(Photo courtesy Diane Augee)

Anne Simpson, Alistair Smith and Alan Taylor at the presentation of the RINA (NSW Section) Prize for Year 3 Naval Architecture
(Photo courtesy Diane Augee)

Anne Simpson, James Heydon and Phil Helmore at the presentation of the RINA (Australian Division) Prize and Medal for the Ship Design Project
(Photo courtesy Diane Augee)

Anne Simpson, Dauson Swied and Phil Helmore at the presentation of the David Carment Prize and Medal for overall performance in Naval Architecture
(Photo courtesy Diane Augee)

Assessment of Risk for Heritage Vessels

The Australian National Maritime Museum has a number of operational heritage vessels which do not meet all modern survey standards/requirements for safe operation. They have organised a gazetted exemption for these vessels, with an exemption being granted on the condition that they be assessed against the applicable standards, non-compliances documented and a risk management plan combined with safe operating procedures developed and implemented to mitigate the risk.

Renjie Zhou has researched the nature and significance of the non-compliances, and how best to mitigate the associated risk, for the Attack-class patrol boat, *Advance*. He has investigated the intact stability, the flooding and damaged stability, and the long-term maintenance aspects.

Analysis of the Inclining Experiment

A new method of analysing the inclining experiment, which removes the restriction in the traditional method that the waterplane area remain essentially constant during the inclining, has been proposed by the Department of Defence. The method was first presented at the Pacific 2013 International Maritime Conference, and an expanded version has been published in the International Journal of Small Craft Technology.

Alistair Smith is conducting an analysis to validate the method using a three-pronged approach. This involves numerical calculations on extreme hullforms, experiments on some of these models, and an analysis of a full-sized inclining experiment using both the proposed method and the traditional method. Numerical calculations are under way, and he has built a tank for testing and a model, and experiments are now under way.

In addition, the inclining of the chine-hulled tug *Bronzewing* by the Year 3 naval architecture students was incorporated as part Alistair's project. The traditional pendulum readings were supplemented by readings taken on a U-tube as well as readings from a laser level, and the results of all three compared. The results of the proposed and traditional inclining analysis methods will also be compared.

It is expected that the overall results will be presented at the Pacific 2015 International Maritime Conference.

NAVL3610 Industry Visits

The Year 3 students in NAVL3610 Ship Hydrostatics and Practice have continued the usual industry visits accompanied by David Lyons and Phil Helmore:

On 20 May we visited Svitzer Australasia at Port Botany where Geoffrey Fawcett showed us over the tug *Svitzer Warang*. We saw the accommodation and then the engine room, noting in particular the Caterpillar main engines, the mufflers, the box coolers, the fire pump, the gensets, the shafting, the control station (the modern slimmed-down version of the MCR) and the bulkhead cable glands. In the propulsion compartment we saw the azimuthing stern-drive units and the spare gear. Up on the foredeck we checked out the towing winch, the towing eye, bulwark structure and the anchoring arrangements, When *Svitzer Warrawee* arrived back from a job, Dennis Arnott gave us a tour of her engine room and foredeck, and gave us his perspective on the turbochargers, fuel injection monitoring, and fendering. Of particular interest was the towhook on the starboard side of the vessel, with the towrope guided through a towing eye on the centreline. The inspection enabled the students to see some of the principles of tug design. Importantly, they were able to see the layout of the vessel, the visibility from the wheelhouse, the propulsion train, arrangements for towing over the bow with the towing winch, and long tows over the stern. The students were impressed with the concept of towing over the bow, the fire-fighting arrangements and the azimuthing stern-drive units. They learned a lot about the towing operation, and a whole range of ship terminology.

On 27 May we visited Lloyd's Register, where Paul O'Çonnor gave the students an introduction to ship classification with a short history of LR, an overview of classification society operations in general, and then the details of ship classification; how, where and why it is done. The students were introduced to design appraisal, construction surveys; special, docking and continuous surveys, to the relationship between the IMO, flag states and classification societies, and to LR's Rules for Special Service Craft. They were all impressed with the overall coverage of classification, and the highlighting of various aspects by talking about particular vessels and problems encountered (and photos of them) brought it all to life. The videos of the Clarke and Dawe commentary on the bow of *Kirki* falling off and the theory of the sinking of *Derbyshire* were particularly impressive.

Post-graduate and Other News

Refurbished MME Buildings

The refurbished tutorial and laboratory buildings of the School of Mechanical and Manufacturing Engineering were re-occupied over the mid-year break, after staff and students had spent the last year-and-a-half distributed in at least four separate locations around the campus.

The redevelopment began six years ago, when prominent Sydney businessman, Dr Len Ainsworth, made a substantial philanthropic donation to UNSW Engineering. The funds from Dr Ainsworth, who has a passion for design and was awarded a degree Honoris Causa from UNSW for his philanthropic work, allowed for the creation of the Mechanical and Manufacturing Design Studio. In early 2014, Dr Ainsworth made another significant gift towards

On board *Svitzer Warrawee*
(L to R) Dennis Arnott, Bernardo Bessone, David Lyons (UNSW Lecturer) Brett Ryall Thales Lobato, Geoffrey McCarey, James Johnston and Jiong Wang
(Photo Phil Helmore)

the construction of the new Mechanical and Manufacturing Engineering precinct.

"Engineers are the salt of the earth, in my view — everything has a background in engineering," says Dr Ainsworth. "My gift has helped UNSW educate our next generation of engineers."

The Dean of Engineering, Professor Mark Hoffman, says that Dr Ainsworth's generosity allows the School to cater for its 1600 mechanical engineering undergraduates, 200 postgraduate coursework students and 130 doctoral research students.

The middle wing, which stood in front of the John Lions Garden, was demolished and rebuilt with twice the footprint and an extra floor. The School's research engine, the Willis Annexe, which was named 25 years ago after the late Professor Al Willis — the School's founding father and later the Dean of Engineering — remained operational during the renovations.

The tutorial building was officially named the Ainsworth Building at the re-opening ceremony on 6 July.

At the heart of the Ainsworth Building is a 350-seat lecture theatre. Student Jessica Drummond inspected the theatre ahead of her first class this semester. "It's brilliantly laid out," she says. "Even though it caters for some of our largest classes, it gives the impression of being an intimate theatre." The modern lecture hall has impressive wi-fi and every student has a power point to recharge laptops during class. It is also brilliant acoustically. "Lecturers don't even need a microphone to speak to the 300-plus students," Professor Simmons says.

Glass windows have replaced concrete walls on the ground floor and this section has dedicated facilities for undergraduate students. There are two purpose-designed CATS (centrally allocated teaching space) rooms and a café that blends into an informal student space. Throughout the building are more student break-out areas. Each is fitted with powered-up benches and modular furniture that students can arrange easily.

For more detail, see *UNSW Engineers — emagazine* at www.engineering.unsw.edu.au/emag/featured-story/new-precinct-unsw%E2%80%99s-engineers

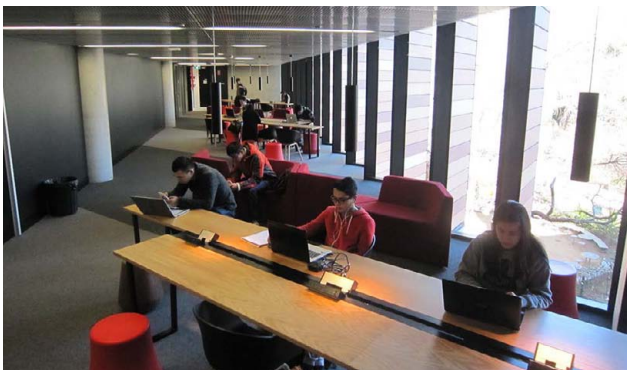
If you are passing, the refurbished buildings are worth a look!

Phil Helmore

Dean of Engineering, Professor Mark Hoffman, Dr Len Ainsworth and Head of School, Professor Anne Simmons, at the re-opening ceremony
(Photo Grant Turner)

Typical staff office in the Ainsworth building
(Photo Phil Helmore)

Typical PhD workspaces
(Photo Phil Helmore)



Typical student workspaces
(Photo Phil Helmore)

Curtin University

The Centre for Marine Science and Technology (CMST) recently gave a course on ship seakeeping to staff at the Directorate of Navy Platform Systems (DNPS). The course was held from 15–18 June in Canberra, and was presented by Dr Tim Gourlay and Dr Kim Klaka of CMST. Topics included: wave theory, forecasting and measurement; ship motion RAOs and statistics; criteria for slamming, motion sickness incidence, motion-induced interruptions; ride control, roll behaviour and roll damping; and operability analysis.

CMST recently led an international benchmarking study into wave-induced motions of cargo ships in shallow water. The study used model test data from Flanders Hydraulics Research, together with the ship motion codes AQWA, GL RANKINE, MOSES, OCTOPUS, PDSTRIP and WAMIT. Results have been published in the OMAE 2015 proceedings — if you would like a copy please contact Tim Gourlay (t.gourlay@cmst.curtin.edu.au).

CMST has two new hydrodynamics postgraduate students. Scott Ha is studying ship under-keel clearance in port approach channels. Scott's background is as a Korean civil engineer, and he has impressed us with his Korean work ethic! He has just written his first paper *Sinkage and Trim of Modern Container Ships in Shallow Water*, which will be presented at the Coasts and Ports 2015 conference in Auckland. This paper uses model test data from Duisburg and Hamburg, as well as CMST's ShallowFlow software. Scott is now working on developing generic sinkage and trim coefficients for different types of cargo ships, and planning a set of full-scale cargo-ship motion trials to validate shallow-water ship motion codes.

Mark Gooderham is studying ship sinkage and trim in restricted waterways. Mark is a master mariner who also manages the Farstad ship simulator in Perth. He is working on three topics:

- sinkage and trim of European inland waterway vessels. Mark will prepare a paper on this for the 2016 Duisburg benchmarking workshop.
- sinkage and trim of ocean-going ships in narrow waterways
- sinkage and trim of ships passing each other, using collaborative model test data from Flanders Hydraulics Research

All of Scott and Mark's research will be publicly available. Scott and Mark bring the number of CMST postgraduate students to around 20 at last count (in areas of marine acoustics, ship hydrodynamics and underwater technology) and we welcome them to the group.

Tim Gourlay

THE PROFESSION

AMSA Domestic Vessel Updates

The following recent regulatory implementations and public consultations have been, or are currently being, undertaken by AMSA Domestic Commercial Vessels (DCV) as part of its streamlining initiatives and regulatory review processes.

New or Amended Exemptions

Exemption 40 — Restricted C Class

Exemption 40 Marine Safety (Class C restricted operations) came into effect on 27 April. Exemption 40 is designed to allow certain low-risk Class 2 or 3 vessels up to 12 m in length and not carrying passengers to operate in certain areas of Class C waters. These areas of operation have been nominated by the respective Marine Safety Agencies and can be found on the AMSA website.

Vessels under EX40 must undergo an initial inspection and subsequent five-yearly inspections (in and out of water) by an accredited marine surveyor to ensure that it is "fit for purpose". The inspections are to determine whether the vessel meets the requirements set out in EX40.

Vessels utilising EX 40 do so under a less-prescriptive methodology, whereby the vessel is deemed as "fit for purpose" by meeting the required outcomes of the exemption. This requires clear communications between an accredited surveyor and the owner to ensure that the surveyor understands the area and nature of the proposed operation and in considering the vessel bears these risks in account at all times. All requirements stipulated in the exemption must be addressed.

Accredited marine surveyors record their inspection in the AMSA prescribed form. This record is to be passed to the vessel owner who must supply it to AMSA in support of an application for a Certificate of Operation.

Supporting material for the exemption is also available on the AMSA website:

- DCV ITS-007 — Instruction applying to the survey of Class 2 and Class 3 vessels applying for an exemption from the requirement to have a CoS under EX40.
- AMSA523 — Application for Class C Restricted Operations
- AMSA650 — Inspection of an EX40 Vessel

Exemption 07 — Marine Safety (Temporary Operations).

Accredited marine surveyors may now issue temporary operations permits for domestic commercial vessels.

As part of streamlining Domestic Vessel processes, Section 5 of Exemption 07 Marine Safety (temporary operations), exemption has been made to allow accredited marine surveyors to issue a temporary operations approval to a vessel which is approaching renewal of its certificate of survey. This bypasses the need for approval by the National Regulator so that the vessel can continue to operate without governmental administrative hold-up. An instruction to surveyors has been drafted to advise accredited surveyors how and when to issue a temporary operations approval. This can be found on the AMSA website.

New Instructions to Surveyors (ITS) and Advisories

AMSA Domestic Commercial Vessels are continually updating and working on instructions to surveyors and advisories to provide better consistency and interpretation of domestic vessel prescribed standards and survey processes. Recent releases have included:

ITS on Inspection, Testing and Replacement Requirements for Fluid Power System Flexible Hoses — Roles and Responsibilities

A recent fire on a DCV was found to have been caused by the failure of a flexible hydraulic hose which allowed pressurised hydraulic fluid to ignite on the exhaust manifold or turbocharger on one of the main propulsion engines. The subsequent investigation identified a number of operational, procedural and administrative failures which all contributed to the causal factors and, ultimately, resulted in the fire on board.

Investigations following the fire identified that the hydraulic hose appeared to be the original hose that was installed when the vessel was built in 1995 and had not been properly inspected, tested or replaced in the intervening period.

This instruction to surveyors highlights to vessel owners, surveyors and crew, through example, the importance of regular and scheduled inspection, maintenance and replacement of machinery hoses in line with manufacturing recommendations and standards.

ITS on Conducting Sea Trials

Commissioning trials are required by the National Standard for the Administration of Marine Safety (NSAMS) prior to a domestic commercial vessel being allowed to operate. This instruction aims to assist in consistent conduct of sea trials on a domestic commercial vessel by providing guidance on what is to be undertaken as a part of initial survey to ensure its ability to safely navigate.

ITS on Welding inspection for aluminium vessel in accordance with AS/NZS 1665

This instruction provides guidance on how to conduct welding inspection on aluminium domestic commercial vessels in accordance with AS/NZS 1665.

Advisory on Fire Protection Systems and Fixed Portable Appliance Inspection and Servicing on Domestic Vessels — Roles and Responsibilities

This advisory has been produced as a recent investigation into a fire on a ferry with 39 passengers off Williamstown, near Melbourne, indicated that further guidance may assist vessel owners, masters and crew as to the responsibilities for fire safety generally and, more specifically, for the inspection and servicing of fixed installations and portable fire extinguishers on board Domestic Commercial Vessels. As a result of this investigation, AMSA has committed to promulgating information widely to increase awareness of the requirements and the reasoning behind them. AMSA will promulgate the report of the incident once a final copy from the investigators becomes available.

Public Consultations on Vessel Standards

Public consultation closed on 31 July for the amendment to Marine Order 503 *Certificates of Survey* and the two draft DCV manual standards applicable to Leisure Craft and Non-Survey Vessels. These two manuals are revisions of the current NSCV Part F2 and the National Standard for General Safety Requirements for Vessels (GSR).

Background to F2 and the GSR

NSCV F2 specifies safety requirements for the design, construction and operation of Class 4 hire-and-drive vessels of less than 24 m in length and operating in relatively low-risk operational areas.

The GSR specifies minimum requirements for the design, construction and equipping of Class 2, 3 and 4 non-survey vessels (including sail training vessels) that are less than 7.5 m in length (with the exception of sail training vessels) and operate inshore or in sheltered waters.

Under the National Law there is a cross-over in the types of vessels covered by F2 with those that apply NSCV Part G — General Requirements (GSR). Interpretational and applicability issues have arisen with the GSR and, to simplify the situation, the Maritime Agencies Forum (MAF) agreed that the GSR would be reviewed and subsumed into F2.

Initial industry feedback was that both standards are difficult to read, contain considerable non-specific cross-referencing to other parts of the NSCV and over-regulate vessels of simple configuration, and lack alignment with international standards, thereby making it difficult and expensive for industry to comply with the requirements. This revision of both standards was intended to result in a 'one-stop shop' for operators of those vessels which fall within its scope.

Consultation

A consultation draft of F2 (which subsumed the GSR) was made available for public consultation to elicit feedback from 2 January 2015 through to 13 February 2015. AMSA received 443 comments during the public consultation period. Those submissions were considered by AMSA and the reference group in March 2015. The submissions and outcomes of the review are published in the *NSCV Part F2 Consultation Report* which is available on the AMSA website.

A key concern raised during public consultation highlighted the complexity surrounding the readability and application of the consultation draft. As a result, to make the information more accessible, AMSA is releasing a new format for standards called the *Domestic Commercial Vessel Manual* (DCV Manual). The idea for the simplification of the standards was introduced during AMSA streamlining initiatives (Concept 1) consultation in 2014. More details can be found in the Streamlining Report (Page 8, Response 1.5) which is available on the AMSA website.

Accordingly, the following drafts which aim to improve readability and simplify application are now being made available for further public consultation:

- Marine Order 503 (Certificates of Survey — National Law) Amendment 2015.
- Domestic Commercial Vessel Manual — Leisure Craft.
- Domestic Commercial Vessel Manual — Non Survey Vessels.

The changes to these documents include:

- Language in the drafts has been simplified and the content re-arranged to reduce complexity.
- The required outcomes for vessels and operations have been moved into Marine Order 503. It is anticipated that the required outcomes relating to operations will be relocated into Marine Order 504 as part of a future review of that order.
- The solutions for meeting the required outcomes for surveyed leisure craft have been contained in their own stand-alone DCV manual.
- The solutions for meeting the required outcomes for Class 2, 3 and 4 non-survey vessels have been contained in their own stand-alone DCV manual.
- Additional American Boat and Yacht Council (ABYC) and Australian Standards (AS) have been included in the manuals to provide more choice for industry.
- Updates to definitions and technical content as indicated in the outcomes published in the 'NSCV Part F2 consultation report'.
- Clarification of the inboard petrol-engine requirements for surveyed leisure craft.
- Inclusion of definitions for 'tour leader' and 'tour'.
- Rearrangement and review of the equipment tables in both manuals.
- Simplified reserve buoyancy calculations

Doug Matchett

FROM THE CROWS NEST

New Book on *Hydrodynamics of High-Performance Marine Vessels* by Lawry Doctors

Em/Prof. Lawry Doctors has recently completed his comprehensive two-volume book devoted to the analysis of common types of high-speed marine vessels. These vessels may also be generally referred to as advanced marine craft. Types of craft addressed include monohulls, catamarans, trimarans and other multihull vessels, air-cushion vehicles, surface-effect ships and planing craft.

The hydrodynamic aspects dealt with are the steady-state resistance, wave generation, sinkage and trim, unsteady effects and motions in waves. Separate chapters are devoted to viscous resistance, transom sterns and the behaviour of skirts for air-cushion vehicles and seals for surface-effect ships. Effects of the finite depth of the water and the possible lateral restriction on the width of the waterway feature prominently in the book. In each case, the presentation includes a full analytical development of the theory accompanied by a comparison of the theoretical predictions with extensive experimental data.

There is a total of 888 full-colour letter-size pages in the two volumes. The text is accompanied by 433 photographs of ships and ship models, 1155 graphs, 1295 equations and 1249 references.

The work represents the author's research, consulting and professional experience in both universities and research centres spanning a period of over fifty years. The book is targeted at university-level students and specialized industry engineers in the field of naval architecture and associated areas.

Contents

Author Biography

Lawrence Doctors graduated from the University of Sydney with a first-class honours bachelor's degree in Mechanical Engineering in 1965 and a Master of Engineering Science degree in 1967. He then studied Naval Architecture and Marine Engineering at the University of Michigan (UM) and received his doctorate in 1970. Since 1971, he has taught at UNSW Australia (UNSW). He was Naval Architecture Program Coordinator for the Bachelor of Engineering degree at UNSW from 1985 to 2004.

During his career, most of Professor Doctors' research efforts have been devoted to numerical ship hydrodynamics, where his interests are centred on the study of advanced marine vehicles. These include monohulls, catamarans, multihulls, air-cushion vehicles, surface-effect ships, planing boats, wing-in-ground-effect craft and hydrofoil boats.

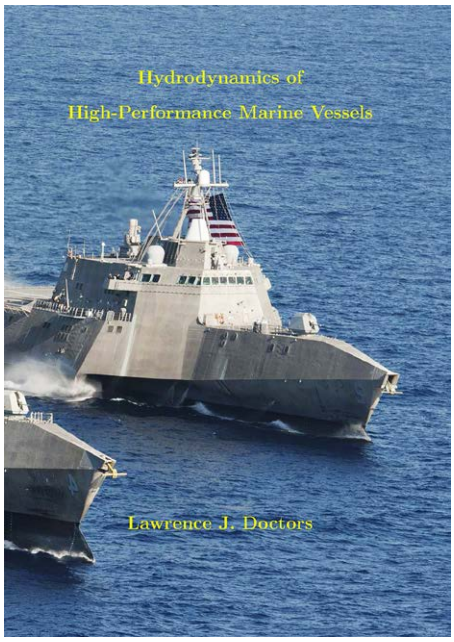
He has published over two hundred and twenty research papers and reports on these subjects. He reviews for more than twenty engineering journals and has been on the scientific or organising committee for around forty international symposiums devoted to the theme of high-speed marine craft. The Featured Papers Committee of the Society of Naval Architects and Marine Engineers has on three occasions selected one of his publications as a Significant Paper.

He has spent periods of research and sabbatical leave at the David W. Taylor Naval Ship Research and Development Center, Tel Aviv University, the UM, the Australian Maritime College, and the University of Strathclyde. His research has been sponsored principally by the Australian Research Council and the US Office of Naval Research.

Purchasing

Hydrodynamics of High-Performance Marine Vessels is now available from Amazon.com. The book is printed in colour and is published in two volumes, because of page-printing limitations. The two links are:

Volume 1: http://www.amazon.com/dp/1512244716
Volume 2: http://www.amazon.com/dp/1514839431



Front cover of each volume of *Hydrodynamics of High-Performance Marine Vessels*
(Image courtesy Lawry Doctors)

MARPOL Annex VI: Low Sulphur Emissions

Operators who are planning new tonnage must have the MARPOL Annex VI legislation foremost in their current investigations. Whilst the NOx emission controls are already in place, the forthcoming global sulphur emission controls will, in 2020, see a signification reduction in acceptable output from 3.5% to 0.5%. Since January 2015, levels in SOx Emission Control Areas (ECA) have already been limited to 0.1%. Existing vessels may choose to retrofit cleaning devices, such as exhaust scrubbers. However, new builds have far broader options and may more-easily consider alternative fuels, such as biofuels or LNG.

Jennifer Knox, a respected professional in the maritime industry, was ahead of her time in this field. As far back as two years ago she was called upon to give a keynote address at the Symposium on Marine Propulsors, when she mused on how the history of shipping before fossil fuels has valuable lessons for shipping in a low-carbon future. She also discussed how current advances in propulsion technologies continue to improve fuel efficiencies.

Jennifer's experience and knowledge is being called on again at the forthcoming Pacific 2015 International Maritime Conference in October. At this event, she will be speaking about the Polar Code and how it will improve ship survivability in Antarctic and Southern Ocean operations. For further information about her paper on low-sulphur and energy-efficient alternatives in shipping, or for a sneak preview of some of the concepts about to be presented on the Polar Code, please contact Lightning Naval Architecture at navlight@bigpond.com.

Phil Helmore

INDUSTRY NEWS

BMT Secures Research Grant for Australia's Next-generation Submarine

BMT Design & Technology (BMT), a subsidiary of BMT Group Ltd, in collaboration with the Defence Science and Technology Organisation (DSTO), has secured funding through the Australian Defence Science Institute's Collaboration Research Grant Scheme which, this year, attracted more than 30 high-quality research proposals seeking over $1.4 million in funding.

The scheme was introduced to enable industry and/or DSTO to undertake collaborative research with DSI participating universities. Through the research grant, BMT will work closely with DSTO and Victoria University to develop a risk analysis and evaluation of emerging technologies, challenges and design solutions for input to the SEA1000 program.

Specifically, the research project will seek to review the range of possible technologies which could be integrated into the future submarine and provide a risk-based assessment of all components and sub-components of the future submarine fire-safety system, from fire prevention, detection and suppression to occupant response/behaviour and emergency procedures.

Aidan Depetro, Senior Engineer at BMT Design & Technology, commented "Australia's next generation submarine is likely to feature a combination of new and existing technologies which, in turn, creates unexplored risks. The severity of those risks, potential mitigation measures and the effectiveness of any proposed control are all unknown and there has been very little work carried out in this area."

He continued: "This study aims to bridge this knowledge gap and build on our existing assurance, risk-analysis and business-case services. Importantly, it provides BMT with the opportunity to offer technical support to the SEA1000 program ,which is the aspiration of many engineers within the Australian defence industry, and none more than those at BMT."

BMT's Unique Fleet Management System Launched at Nor-Shipping

BMT SMART Ltd (BMT), the specialist fleet and vessel performance management company of BMT Group, launched its new, cost-effective SMART^{FLEET} Management system at Nor-Shipping in Oslo in June. Peter Mantel, Managing Director of BMT SMART, commented "Whilst there are cost savings to be made through on-board optimisation, these are often extremely hard to quantify in a verifiable way, and these types of tools can be seen as a burden to the crew. It's for this reason that we wanted to focus our attention on shore-side performance management and provide ship owners and charterers with an easy-to-use shore based management tool which can manage whole fleets of vessels, and not just those which they own and operate."

The SMART^{FLEET} Management system uses accurate met-ocean data in combination with BMT's powerful algorithms to isolate the different components which contribute to overall vessel performance and, in turn, help identify the cause of the inefficiencies and quantify the effectiveness of any adjustments that have been made.

The system incorporates five unique KPIs:

- **Power coefficient** — used to monitor the propulsive power. Increased power absorption, due to the effect of fouling on the hull or propeller, for example, is reflected by an increase in the power coefficient value
- **Fuel coefficient** — has similar features and characteristics to the power coefficient, but it represents the overall change in fuel consumption due to the efficiency of the main engine, as well as the vessel's resistance
- **Hull condition coefficient** — gives the relationship between the shaft rpm and the vessel's speed through the water. This provides a measure of changes to the hull condition over time
- **Propeller condition coefficient** — is used to monitor the efficiency of the propeller by modelling the relationship between shaft power and rate of rotation.

- **SFOC coefficient** — is used to the monitor the efficiency of the engine.

Peter Mantel continued "Nor-Shipping provides us with a great opportunity to demonstrate to industry the range of solutions we have on offer — all of which we believe can help optimise shipping operations worldwide. Our recent partnership agreements with both Aage Hempel and AMI Maritime reinforce our commitment to engaging with like-minded companies and push us closer to our goal of providing world-leading local service at all major shipping ports."

NavCad® and CAESES®

The 14th Conference on Computer Applications and Information Technology in the Maritime Industries (COMPIT) was recently held in Ulrichshusen, Germany. One paper by the directors of HydroComp, Inc. (Durham, NH, USA) and Friendship Systems AG (Potsdam, Germany) described a new achievement in collaborative optimised design with highly-efficient client-server tools.

The paper describes the steps undertaken to couple CAESES® by Friendship Systems and HydroComp NavCad® (Premium Edition) for an AUV optimisation project, including program settings, data communication and scripting API, optimisation strategies, and design study outcomes. CAESES was responsible for geometric modeling and optimisation. Hydrodynamic analysis was carried out by NavCad operating in a silent "server mode". NavCad was chosen for this project as a computationally-efficient alternative to higher-order codes when it was found that the functional design space was limited by the computational time necessary to evaluate each variant. To narrow the design space prior to final analysis and to establish quantitative points of reference, NavCad was used for the automated prediction of resistance and propulsion for each of the CAESES design variants.

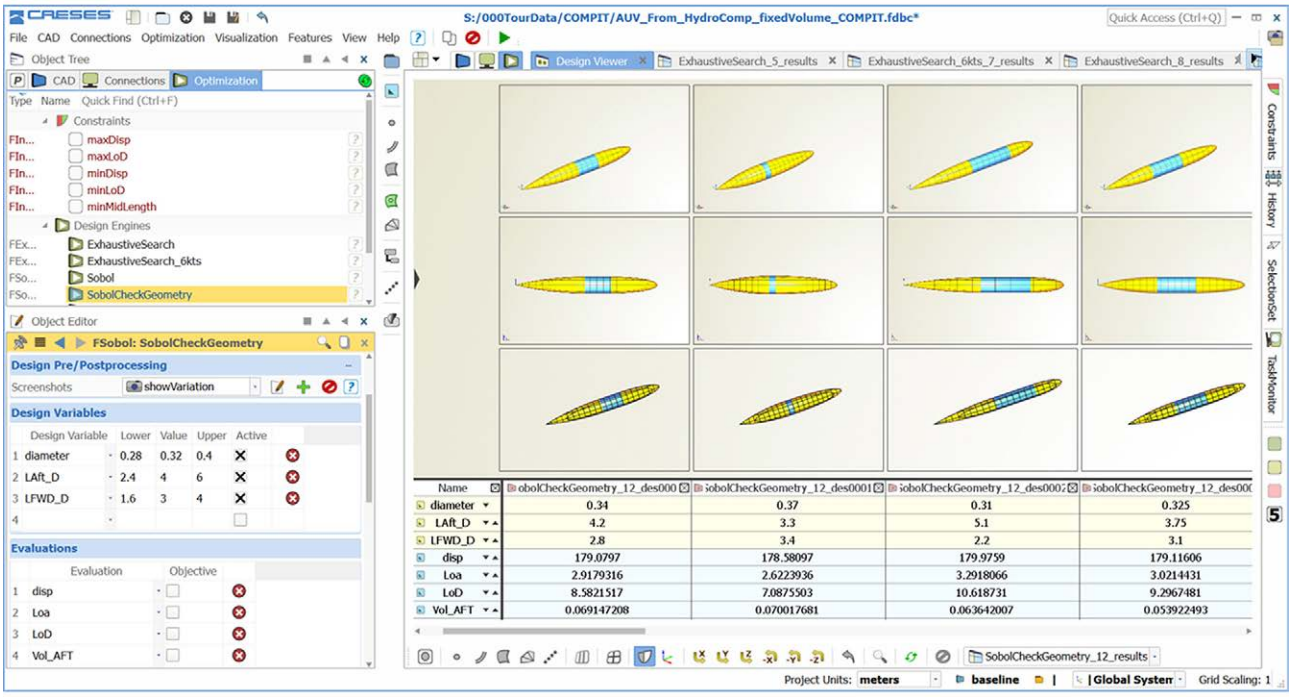
An important conclusion drawn from the study was that it is not enough to have an optimising modeler or an efficient hydrodynamic solver. Real productivity is attainable only when a very-efficient hydrodynamic analysis simulation solver is employed by a design tool with integrated optimising capabilities — such as the pairing of CAESES and NavCad. Each design variant required just five seconds on a typical business-grade computer to revise the geometry, re-evaluate the resistance, size an optimum propeller, and predict full system propulsion. If a fully rendered image was required for the variant, the duration was less than 12 s per investigated variant.

The linked modeling and optimisation capabilities of CAESES and the very-broad and comprehensive prediction models in NavCad make this a valuable pairing for hullform design of any marine vehicle. To read the full paper, visit HydroComp's NavCad Premium Edition page (www.navcad-premium.com), or find it as part of the COMPIT 2015 proceedings at www.compit.info (via the Downloads link). You can also read about the international collaboration efforts on the CAESES News page, at www.caeses.com/news/2015/new-publication-auv-design-global-style.

World's First Dual-fuelled Dredger to be Powered by Wärtsilä

A new-generation Antigoon-class dredger, *Scheldt River*, being built by Royal IHC (IHC) in the Netherlands on behalf of the Belgium-based DEME Group, is to be powered by Wärtsilä dual-fuel (DF) engines. This will be the first-ever dredger to operate on engines capable of utilising either liquefied natural gas (LNG) or conventional marine fuels. The contract with Wärtsilä was signed in July.

The 104 m long vessel will have a hopper volume capacity of approximately 8000 m^3. The scope of supply includes one 12-cylinder and one 9-cylinder Wärtsilä 34DF engine, two



Design assessment with CAESES Design Viewer
(Image courtesy HydroComp)

Scheldt River will be the world's first dual-fuelled dredger
(Image courtesy Wärtsilä)

Wärtsilä controllable-pitch propellers and two transverse thrusters as well as the company's patented LNGPac gas supply and storage system.

"Wärtsilä's unmatched experience and extensive reference list in dual-fuel engine applications, plus our complete solutions portfolio, were key considerations in the award of this contract. We congratulate the shipyard and owners for taking the decision to have this new dredger become the first to be capable of using LNG or diesel fuel," said Lars Anderson, Vice President, Engine Sales, Wärtsilä Marine Solutions.

"Environmental considerations are extremely important for every new vessel built today. Operating on LNG allows DEME to set new standards in minimising harmful emissions. *Scheldt River* will easily comply with all local and international environmental regulations. Wärtsilä's dual-fuel know-how and, in particular the 34DF engine series, made our concept feasible," said Jan Gabriël, Head of New Building and Conversion Department at DEME.

This is the second notable order received by Wärtsilä recently for dredger-related propulsion solutions. In June, the company was contracted to supply a comprehensive intergrated solutions package for one of the world's largest and most-advanced self-propelled cutter dredgers currently under construction in China.

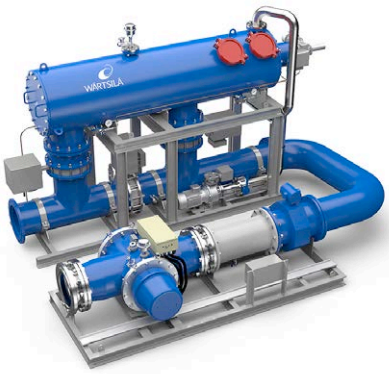
Wärtsilä wins Ballast Water Management Systems Order

Wärtsilä has received another important order for its Ballast Water Management Systems (BWMS). Three new container ships being built for a major European shipping company at the Jinhai Shipyard in China will be fitted with Wärtsilä Aquarius UV BWMS. The order was placed with Wärtsilä in the first quarter of 2015.

Wärtsilä will deliver the BWMS equipment to the first vessel at the end of 2015 and to the other two ships during 2016. This latest contract follows the order placed last year from the same company, where Wärtsilä BWMS equipment was installed into three 2100 TEU container ships built in Asia, and which were delivered in December 2014.

Each of the three vessels will be fitted with a 500 m^3 capacity Wärtsilä Aquarius UV BWMS. This system utilises a two-stage approach involving filtration and medium-pressure UV disinfection technology. Wärtsilä has already obtained IMO Type Approval and Alternate Management System (AMS) acceptance from the US Coastguard (USCG) for this system, and work to achieve full USCG Type Approval for all products in the Aquarius BWMS range commenced early in 2014.

"Ballast water management is an important feature of the overall emphasis on environmentally-sustainable shipping. Wärtsilä has always paid great attention to working in close cooperation with the customer to ensure that the selected system is appropriate for the ship and its operating profile, and this has been the case here as well. We have enjoyed working closely with the owners and with the Jinhai Shipyard, and have received excellent support in planning this project," said Lars Bo Kirkegaard, General Manager, BWMS Sales, Wärtsilä Ship Power.



The Wärtsilä Aquarius UV Ballast Water Management system utilises a two-stage approach involving filtration and medium-pressure UV disinfection technology
(Image courtesy Wärtsilä)

VALE

Owen Hughes

It is with sadness that *The ANA* records the passing of Owen Francis Hughes on 4 June 2015 in Blacksburg, VA, USA. Owen was born in Chicago, Illinois on 7 November 1939. He received his BS degree in naval architecture from Massachusetts Institute of Technology (MIT) in Boston in 1961, and his MS in naval architecture from there in 1963. He came to the University of New South Wales in 1963 to help open the new Opus Dei college in High St (which became Warrane College on Anzac Parade), to teach ship structures to the aspiring naval architects and numerical methods to engineers, and to do his own PhD in fluid dynamics, which was awarded by UNSW in 1969. He remained teaching at UNSW until 1973, when he returned to the USA and took up the position Senior Lecturer in Aerospace and Ocean Structures at Virginia Polytechnic and State Institute (Virginia Tech.), and became Professor of Ocean Structures in 1979. He was eventually awarded Professor Emeritus status, and was still teaching in the semester recently concluded in the USA!

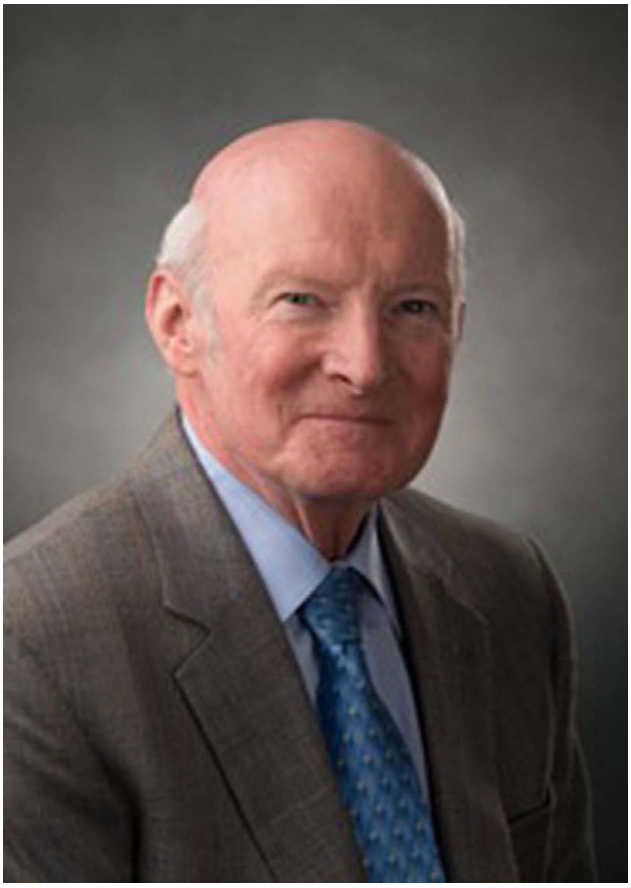
In 1970 he attended his first International Ship Structures Congress (ISSC) in Tokyo (the fourth ISSC). Since there was no one else from Australia there, he became the Australian correspondent. The ISSC had a big effect on him, and confirmed his decision to change over to structures from his PhD in fluid mechanics. At last count he had attended 15 ISSC congresses and, at the one in Rostok in Germany in 2012, that number was recognised as the all-time endurance record!

Brian Robson was the Director of Naval Ship Design in Canberra, and realised that The Department of Navy needed to be self-sufficient (not relying on other navies). In 1973, through Brian's efforts, Owen received a grant from the Department to develop an indigenous ship structural evaluation and design capability. Funded by this grant, Farrokh Mistree joined him at UNSW and they developed RANSAP (RAN Structural Analysis Program) and SLIP2 (sequential linear programming — second order) to optimise ship structures. The two programs were then merged into the automated ship structural evaluation system (AUSEVAL). On sabbatical at MIT, he began developing this into SHIPOPT (Ship Structural Optimisation Program), and this eventually morphed under his own development into MAESTRO (Modelling, Analysis, Evaluation and Structural Optimisation), which is now used by 13 navies, various structural safety authorities, and by over 80 structural designers and shipyards in Europe, North America, Asia and Australia.

Owen was contacted by Prof. Michael McCormick of the US Naval Academy, who was the editor of the Ocean Engineering series of books published by JohnWiley & Sons. Michael invited him to write a book on ship structures, which he did and titled *Ship Structural Design: A Rationally-Based, Computer Aided Optimization Approach* (SSD). The book was published by Wiley and marketed as a reference book, which is why it has few examples and no exercise problems. Their target was libraries, shipyards and ship design agencies, both naval and commercial. They did a good job of marketing, and negotiated translations into Chinese and Russian. In 1988 Wiley sold the last copy of SSD. They knew they had saturated the reference-book market, so they declined another printing. In such a case the copyright reverts to the author. Owen's intended audience had always been students, and knowing SNAME's generous policy on student prices, he donated the copyright to them. The final revision of the book was published by SNAME in 2010, and is used by naval architects the world over.

Owen dedicated his entire career to the advancement and improvement of ship structures, and the education of students in ship structures. Many naval architecture graduates of UNSW can thank Owen for their solid grounding in ship structures and, for some, in numerical methods as well.

He is survived by sisters Clare Hughes of Washington DC, and Mary Ellen Hughes of Key Biscayne, FL, USA.



Owen Hughes
(Photo from Virginia Tech. website)

Further details of Owen's career may be found in his *My Story* in the book *Ships and Offshore Structures,* published by Taylor and Francis, or as a PDF file on request from p.helmore@unsw.edu.au.
Phil Helmore

Warwick Hood AO

It is with sadness that *The ANA* records the passing of Warwick Hood on 6 July 2015. Warwick was born in Westmead in July 1932, and attended Wentworth Public School, then Parramatta High School, inland from Sydney Harbour where his later life was centred. It was during a family holiday to Pearl Beach on the Central Coast of New South Wales that he became interested in sailing. He built his first boat, a wooden VJ, in the back yard of his Wentworthville home and began racing it in 1945, when he was 13 years old.

Leaving school, he had considered joining the merchant navy but chose instead to pursue a career in shipbuilding. He gained an apprenticeship at Cockatoo Island which included the diploma course in Naval Architecture at Sydney Technical College and he graduated in 1954. During his time at Cockatoo Island he was involved with various rewarding naval shipbuilding projects, including HMAS *Tobruk* and the two Daring class destroyers, HMAS *Voyager* and HMAS *Vampire* — the latter now a floating exhibit at the Australian National Maritime Museum. He worked alongside Alan Payne, who also became one of Australia's leading yacht designers, and formed a friendship with Alan which became a significant influence on the direction of his career.

In late 1956, Alan invited Warwick to join his own naval architecture practice, which had a number of yacht design projects under way. With his wife Julie's support, Warwick left the security of the public service job and began a pathway that led to a life of challenging and diverse projects. He was able to work in the arena of the highest level of yacht design and racing, as well as creating some of the first Australian-designed yachts to be built using aluminium or fibreglass. He designed a paddle steamer for the Murray River, but also worked on designs for an innovative project for fast ships to carry bulk freight across Bass Strait, and prepared a number of transport plans for developing countries.

He remains best known for his work in the first of these — the high-tension field of designing yachts for the America's Cup, the pinnacle for yacht racing then and now. At Alan Payne's practice he became a key member of the team which developed the design for *Gretel*, Australia's first challenger for the America's Cup in 1962. Soon after, Alan went into other areas of engineering, and Warwick set up his own practice. His first design was an aluminium catamaran, followed by *Yampl*, the first aluminium ocean racing yacht built in Australia.

Victorian interests then asked Warwick to design their Australian challenger for the 1967 America's Cup, and here the experience of the 1962 project became a strong foundation for an even more demanding task that was set for the 1967 series. The American defenders had used their discretion to allow Australia access to tank-testing facilities and materials from US sources for critical work during the 1962 design and construction of *Gretel*. Perhaps they underestimated Australia's abilities, as the subsequent racing was much closer than they anticipated. For 1967 they were much more rigid about the Deed of Gift requirement for the yacht to be 'designed and built' in the country of origin. This meant that Warwick's design and construction for *Dame Pattie* was 100% Australian and they had to develop

Warwick Hood
(Photo Douglass Baglin)

and manufacture to the highest standard for racing many things that had previously been sourced from overseas as stock items. The yacht was superbly built by Bill Barnett in Berry's Bay, and optimised around a light-to-moderate wind range which studies showed were the typical conditions for the event. Unfortunately, it was a series sailed in much stronger winds, and the US defender *Intrepid* was able to handle these better, winning 4–0, a score that did not reflect the standard of *Dame Pattie*'s preparation by its team of designers, builders and sailors.

Warwick moved on from the America's Cup with further yacht designs, but had already ventured into production craft with the Hood Boat Company in 1966, which built the first Australian-designed fibreglass production yachts. Three models were made, the 20, 23 and 27, reflecting their length in feet. They were multi-chine, raised-deck craft which were easy to sail and made the sport accessible to many more people. The classes were popular and raced in various states.

Warwick was also very proud of his support of Sir Francis Chichester's record of becoming the second man to achieve a true circumnavigation of the world solo with his yawl *Gipsy Moth IV* in 1966–67 after Joahua Slocum in his gaff-rigged sloop *Spray* in 1895–98.. During the Sydney stop-over, Warwick reconfigured the keel and other details to make the yacht manageable and Chichester completed the voyage safely.

Commercial work included an intriguing project with Gordon Barton who managed IPEC freight services. Barton obtained support for a project to use fast ships to carry bulk freight across Bass Strait in competition with planes. Based around fast, narrow ships with basic staffing, the plan involved coordination of the vehicles, containers and handling at both ends to make the operation economic. Hood developed the design of the vessels and worked on

the manning requirements. The intention was to operate two ships in tandem crossing over mid-strait, and Hood worked out a staffing arrangement of three deck officers and two engineers, all with watch certificates so that the bridge was constantly staffed by qualified crew. Unfortunately the project was abandoned when the Tasmanian Government withdrew their funding support and other backers would not proceed alone.

In complete contrast, his 1980s design for the Murray River paddle steamer *Emmy Lou* has a 1908 Marshall and Sons steam engine, and was staffed traditionally with engineers holding steam qualifications. Two further sister ships were built from this design.

As a consultant, one of Hood's primary sources of work was preparing maritime-related transport plans for developing countries. The final detailed reports came with advice on appropriate vessel designs and the infrastructure needed. The first one was for Guyana in South America, but he also prepared plans for Indonesia, Papua New Guinea, Solomon Islands and other Pacific nations. The World Bank was instrumental in supporting this work.

As with many other principal designers, his own practice was a starting point for others who went on to have their own successful consultancies. Warwick employed many who later became well-known names in the marine field, including John Bertrand, Jan Faustmann, Alf Lean, Don McGeechie, Peter Gosher, Tony Hearder and Glen Davis.

Warwick Hood was made an Officer of Australia (AO) in 1994 for his services to the maritime industry as a naval architect.

Many of his Hood class designs remain sailing around Australia. *Emmy Lou* is currently operating out of Echuca as a charter vessel, while the legendary *Dame Pattie* became a cruising yacht and is now moored at a marina in Monaco on the Mediterranean.

Warwick Hood is survived by his partner Jennifer Dakers, former wife Julie Hood (Mazlin), daughters Carly and Alison, four grandsons, a brother and a sister.

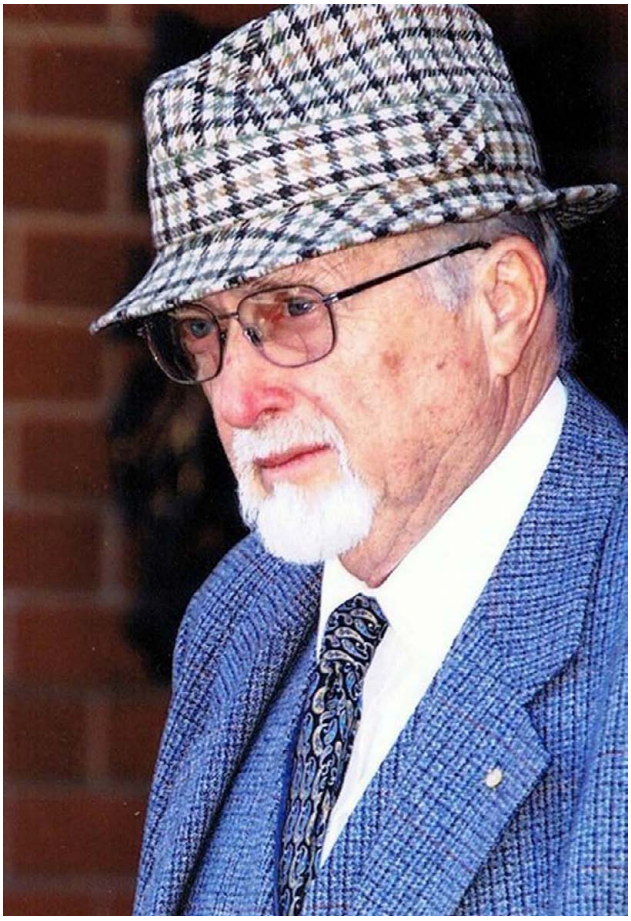
David Payne

Peter Joubert AM

Emeritus Professor Peter Numa Joubert AM, who died aged 91 on 13 July 2015, was a man of many remarkable skills and achievements, ranging from being a distinguished academic and noted authority on fluid mechanics to being the only 'amateur' to design a Sydney Hobart Yacht Race overall winner.

A member of the Cruising Yacht Club of Australia since 1973, Peter Joubert designed *Zeus II*, a Currawong 31 which won the 1981 Sydney Hobart, as well as other yachts which won their divisions of this ocean classic. *Zeus II* is still racing, aged 37, although now restricted to competing on Sydney Harbour.

He will be remembered as a designer of ocean racing and cruising yachts but, perhaps more significantly, for his role in offshore yachting safety and in road safety, including the design and mandatory installation and use of car seat belts.



Peter Joubert

An active sailor from the time he grew up in Sydney, Peter Joubert competed in 27 Sydney Hobart races, mostly skippering yachts of his own design which he named after Australian birds, including the Currawong 31 and Brolga 35. More than a hundred yachts have been built to his designs.

In 1993 he was awarded the CYCA Commodore's Medal for outstanding seamanship after his yacht rescued eight survivors from a yacht which foundered at night in a strong gale during the Sydney–Hobart. Peter survived the Sydney Hobart storm of 1998, although his yacht capsized, but later righted itself.

He received a medal in the Order of Australia in 1996 for his contribution to road and yacht safety and, in 2009, was made a Member of the Order of Australia (AM) for research in the field of fluid mechanics, particularly in relation to submarine design and education.

While yacht design was more a sideline to his major research in mechanical engineering, he was a member of the Society of Naval Architects and Marine Engineers and authored more than ten papers in the *Journal of Ship Research*. These included investigations of the forces caused by slamming impact on yacht hulls.

Peter and I had been friends for more than 35 years and as a sometime crewman on one of his Currawong 31s, *Lollipop* (fourth overall in the Sydney Hobart in 1977 and beaten only by three maxi-yachts). We enjoyed many discussions on yacht design and construction and crew safety rules over the years.

Last year, then living in retirement in the Melbourne suburb of Kew, Peter sent me a copy of a book he had written about

yet another chapter in his life — as a young RAAF fighter pilot on active duty in New Guinea during World War II.

It gave me a fascinating insight into his early years, including details of a flying accident which led him into research on seat belts for road safety and safety harnesses for yachtsmen racing offshore.

Before graduating to more advanced fighter aircraft, Peter was flying a Tiger Moth biplane when the aircraft flipped as it landed, leaving him hanging upside down in his pilot's harness.

"I landed a fraction short and the plane slowly tipped over… crunch," he recalled. "I'm hanging in my straps with my head about a foot from the ground, and I could have poled my head into the ground. I would have been a quadriplegic."

It was a powerful lesson in the life-saving value of a seatbelt — one he would never forget.

Unquestionably, Peter's later research and passionate drive to have governments introduce mandatory laws on seat-belt use saved many Australian lives in road accidents.

When the war ended, Peter benefitted from a training course which allowed him to finish his matriculation and then undertake engineering at the University of Sydney. His academic work and research would lead him to become Professor of Mechanical Engineering at the University of Melbourne.

He retired in 1989 but continued his work as an Emeritius Professor at the University, which included a study of separating flow about a submarine hull when engaging in a turning manoeuvre, and advising the Department of Defence and senior naval officers on hull shapes for the RAN's submarines.

When I last spoke to Peter, he invited me to join him for lunch at the Melbourne Club "next time you are in Melbourne." Sadly, we never got together for that lunch.

Peter Campbell

MEMBERSHIP

Australian Division Council

The Council of the Australian Division of RINA met on Wednesday 24 June 2015 by teleconference based in Sydney. In opening the meeting, the Division President, Tony Armstrong, welcomed Matthew Williamson as a new Council member, noting that the other new member, Jesse Millar, was unable to attend.

Some of the more significant matters raised or discussed during the meeting are outlined as follows:

Possible Future Division Activities

In response to the list of possible activities put forward by the President in his February column in *The ANA*, Council considered how it should manage consideration of the listed items, including allocation of resources to address them. To prepare for further consideration at Council's September meeting, it was agreed that Council members would inter-sessionally comment on and prioritise the various items.

Australian Naval Shipbuilding and Repair Capability

Council noted that the Senate Economic References Committee was due to have reported in the week before the meeting. The Secretary advised that the Division had not been called to appear before it following the submission lodged in November 2014. There had been no progress made by the committee established by the March Council meeting.

Council noted the positive announcement in May of a continuous build program by Defence Minister Andrews and that there was likely to be a number of developments over forthcoming months. One of these was the scheduled keynote address by Rear Admiral Mark Purcell to Pacific 2015, another being the expected release of the Defence White Paper.

It was agreed that, for the time being, Council would keep watch on emerging developments and discuss the matter further at its September meeting.

National System for Domestic Commercial Vessels

Council noted that an information session on the surveyor accreditation had been held in Sydney on 16 March, and further similar sessions had been held covering most ports along the east coast to Hobart. Details of other developments were provided on the AMSA web-site and in the quarterly publication *Working Boats*.

PACIFIC 2015 IMC

Council received a report indicating that preparations were well advanced for the Conference on 6–8 October. Engineers Australia has come on board as a joint host institution; their participation is now reflected in advertisements. Registrations are open and an exciting programme has been arranged.

Walter Atkinson Award for 2015

Noting that nominations for the Award would close in mid-July, Council agreed to the appointment of a panel to make a recommendation to the September Council meeting on the winner(s) of the award.

London Council

It was noted that the Institution's Council has instigated a review of the technical committees.

Next Meeting of Council

The next meeting of teh AD Council is scheduled for Wednesday 16 September at 13.00 Western (15.00 Eastern) Standard Time.

Rob Gehling
Secretary

Continuing Professional Development

Continuing Professional Development (CPD) is the systematic maintenance, improvement and broadening of knowledge, understanding and skills, and the development of the personal qualities, necessary to carry out professional and technical duties throughout a member's working life.

Continuing Professional Development will therefore enable the member to:

- Update professional competence, so that practice is fully in line with current requirements.

- Develop personal and management skills.
- Broaden experience leading to new career opportunities.

Continuing Professional Development can be achieved through a range of activities, both in and outside the workplace, which are related to members' careers as professional engineers. The types of activity which contribute towards members' Continuing Professional Development and their obligations as a member of the Royal Institution of Naval Architects are described in the RINA publication *Guidance on Continuing Professional Development* available at www.rina.org.uk/guidance_notes.html.

All Fellows, Members and Associate Members who are in or seeking active work are required to take all reasonable steps to maintain and develop their professional competence and knowledge after election. The Institution requires that members achieve a minimum of 35 hours of CPD activity per annum. However, it is expected that most members will exceed this amount.

The Institution requires that CPD activities should be authenticated either by mentors, employers or the providers of CPD. Some informal learning activities may be self-authenticated. The roles of the mentor, employer and the Institution in assisting members to achieve their CPD are described in the *Guidance* document.

The Institution places an obligation on its members to plan and record their CPD and to produce evidence of their CPD achievement. The Institution may request to see a member's CPD Plan and Record at any time, and when upgrading class of membership.

RINA Council and Committee Members

To keep members up-to-date with who is doing the hard yards on their behalf in Australia, current council, section and committee members are as follows:

Australian Division

President	Tony Armstrong
Vice-president	Martin Renilson
Secretary	Robin Gehling
Treasurer	Craig Boulton
Members nominated by Sections	
	Adrian Broadbent (NSW)
	Antony Krokowski (Qld)
	John Lord (ACT)
	Kalevi Savolainen (WA)
	Karl Slater (Vic)
	Alan Muir (Tas)
	Graham Watson (SA&NT)
Members elected or appointed by Council	
	Danielle Hodge
	Craig Hughes
	Jesse Millar
	Vesna Moretti
	Mark Symes
	Matthew Williamson

ACT Section

Chair	Tom Dearling
Deputy Chair	Ray Duggan
Secretary	Joe Cole
Assistant Secretary	Caitlin Hoey
Treasurer	Claire Johnson
Nominee to ADC	John Lord
Members	Richard Dunworth
	Martin Grimm
	Warren Smith

NSW Section

Chair	Alan Taylor
Deputy Chair	Valerio Corniani
Secretary	Anne Simpson
Assistant Secretary	Nathan Gale
Treasurer	Adrian Broadbent
Nominee to ADC	Adrian Broadbent
Auditor	Sue-Ellen Jahshan
TM Coordinator	Phil Helmore
Members	Craig Boulton
	Graham Taylor
	Rob Tulk

Queensland Section

Chair	Mark Devereaux
Deputy Chair	Tommy Ericson
Secretary	Cameron Whitten
Treasurer	James Stephen
Nominee to ADC	Antony Krokowski
Members	Dean Biskupovich
	Peter Holmes
	Jon Pattie
	Adam Podlezanski

South Australia and Northern Territory Section

Chair	Graham Watson
Deputy Chair	Malcolm Morrison
Secretary	Danielle Hodge
Treasurer	Danielle Hodge
Nominee to ADC	Graham Watson
Members	Neil Cormack
	Peter Dandy
	Nik Parker
	Jan Verdaasdonk

Tasmanian Section

Chair	Jonathan Binns
Secretary	Mark Symes
Treasurer	Jonathan Duffy
Nominee to ADC	Alan Muir

Victorian Section

Chair	Andrew Mickan
Secretary	Lance Marshall
Treasurer	Trevor Dove
Nominee to ADC	Karl Slater
Members	Joseph Cook
	Siobhan Giles
	Colin Johnson
	Hugh Torresan

Western Australian Section

Chair	Matthew Williamson
Deputy Chair	Gerard Engel
Secretary	Mal Waugh
Treasurer	Troy Munro
Nominee to ADC	Kalevi Savolainen
Members	James Burton
	Nick Bentley

	Timothy Brazier
	Yuriy Drobyshevski
	Ben Fell
	Vesna Moretti
	Mike Priestley

The Australian Naval Architect

Editor-in-chief	John Jeremy
Technical Editor	Phil Helmore
Referee	Noel Riley

Naval Shipbuilding Advisory Group

Members	Tony Armstrong
	Adrian Broadbent
	Robin Gehling
	John Lord
	Mike Mechanicos

Walter Atkinson Award Committee

Chair	Kim Klaka
Members	Lance Marshall
	Alan Muir

RINA London

Board of Trustees	Robin Gehling
Council Members	Tony Armstrong (*ex officio*)
	Robin Gehling
Safety Committee	Robin Gehling
High-speed Vessels	Tony Armstrong

RINA/Engineers Australia Joint Board of Naval Architecture

Members	Stuart Cannon
	Robin Gehling

National Professional Engineers Register Naval Architecture Competency Panel

To be advised

Pacific 2015 Organising Committee

Chair	John Jeremy
Members	Adrian Broadbent
	Stuart Cannon
	Tauhid Rahman (representing IMarEST)

Changed contact Details?

Have you changed your contact details within the last three months? If so, then now would be a good time to advise RINA of the change, so that you don't miss out on any of the Head Office publications, *The Australian Naval Architect*, or Section notices.

Please advise RINA London, *and* the Australian Division, *and* your local section:

RINA London		hq@rina.org.uk
Australian Division		rina.austdiv@optusnet.com.au
Section	ACT	rinaact@gmail.com
	NSW	rinansw@gmail.com
	Qld	m-dever@hotmail.com
	SA/NT	danielle.hodge@defence.gov.au
	Tas	mfsymes@amc.edu.au
	Vic	andrew.mickan@dsto.defence.gov.au
	WA	rina.westaus@gmail.com

Phil Helmore

THE INTERNET

Webcasts of NSW Section Technical Presentations

Engineers Australia records selected technical presentations made to RINA (NSW Section) and IMarEST (Sydney Branch) for webcasting. The recordings are placed on the Engineers Australia website, usually within a few days of the presentation.

All of the recorded webcasts up to 30 September 2014, together with hotlinks to each one, are listed at

www.rina.org.uk/NSWwebcasts.html.

On 1 October 2014, Engineers Australia started using a new system for recording presentations, using three cameras and a hand-held microphone, with an audio technician in attendance. Webcasts are placed on the Engineering on Line (EoL) website at www.engineeringonline.com. The first presentation to be recorded with this new system was Graham Taylor's presentation on *LNG — The New Marine Fuel?* on 1 October 2014, and the presentation is up on the EoL website at www.engineeringonline.com/video/xjkrsdrf/lng-the-new-marine-fuel. Details of how to access this recording were given in the February 2015 issue of *The Australian Naval Architect*.

However, Engineers Australia has now discontinued using the new recording method and the EoL website for regular monthly presentations, and has resumed using Mediavisionz while considering options for future meetings

In 2015, one recording has been made so far, and the link to the recording made on 1 April 2015 is shown on the NSW webcasts website.

For further recordings, watch this space!

Phil Helmore

NAVAL ARCHITECTS ON THE MOVE

The recent moves of which we are aware are as follows:

William Birdsall has moved on from International Maritime Consultants and has gone back on the tools, working for Austal Ships in Fremantle, WA.

Josh Bolin has moved on from van Oossanen Naval Architects in The Netherlands and has taken up a position as a naval architect with Guido Perla and Associates, an offshore design and engineering office, in Seattle, USA.

Luke Chang moved on from Warwick Yacht Design many moons ago and, after two years at Demat Marine Design, has taken up the position of Technical Manager with (and is now a partner in) Al Manzel Houseboats & Marinas in Umm al-Quwain, United Arab Emirates.

Li Chen has moved on from A Secret Business and has taken up a position as a naval architect with Incat Crowther in Sydney.

Joe Cole returned from the ANLO Bath position in December 2013 and took up the position of Concept Development Manager within the Directorate of Navy Platform Systems in the Naval Engineering Division in Canberra.

Daren Collopy has moved on from BMT Defence Services and has taken up the position of Head of Information and Communications Technology with PMY Group, a strategic consultancy operating across the sport, entertainment, government and infrastructure sectors, in Melbourne.

Stephen Cook moved on from Brisbane Ship Constructions many moons ago and, after five years at Saipem, in 2011 took up the position of Maritime Engineer with Arup in Brisbane.

Andrew Cooper moved on from Australian Marine Technologies in 2014 and has taken up the position of Senior Naval Architect at ThyssenKrupp Marine Systems Australia in Melbourne.

Yang Du, a recent graduate of UNSW Australia, has gone on to enrol in a Master of Business degree at the University of Wollongong.

Matthew Fox has moved on from the Centre for Maritime Engineering and has taken up a position as a Naval Hull Surveyor with G.A. Glanville & Co. in Cairns.

Nathan Gale has moved on from FP Marine and has taken up a position as a naval architect with Rolls-Royce Australia Services, contracting to the Amphibious and Afloat Support System Program Office on Garden Island, Sydney.

Pranjal Gupta, a recent graduate of UNSW Australia, has taken up a position as sales consultant with Euro Solar in Sydney.

Fergus Hudson, a recent graduate of UNSW Australia, has taken up a position as a naval architect with Incat Crowther in Sydney.

Alex Law has moved on from Rolls-Royce Australia Services, and has taken up a position as a naval architect with Incat Crowther in Sydney.

This column is intended to keep everyone (and, in particular, the friends you only see occasionally) updated on where you have moved to. It consequently relies on input from everyone. Please advise the editors when you up-anchor and move on to bigger, better or brighter things, or if you know of a move anyone else has made in the last three months. It would also help if you would advise Robin Gehling when your mailing address changes to reduce the number of copies of *The Australian Naval Architect* emulating boomerangs (see *Missing in Action)*.

Phil Helmore

MISSING IN ACTION

The following members have disappeared from the radar. Their last known location is shown below:

A M Brany	Perth, WA 6000
J Elcheikh	Melbourne, VIC 3207
N A Ivanovic	Williamstown, VIC 3207
E Jorgensen	Ashfield, NSW 2131
G I Muir	Maryborough, QLD 4650
L M Troyer	Launceston, TAS 7250
W E G Webb	Turramurra, NSW 2074

If any member knows where the missing persons are now, could they please let the Secretary, Rob Gehling, know by phone on 0403 221 631 or email rina.austdiv@optusnet.com.au.

Clean, painted and ready for sea — the Australian National Maritime Museum's *Endeavour* on the transporter ready for re-launching at Sydney City Marine recently (Photo David Salter)

FROM THE ARCHIVES

HMAS TOBRUK
1981–2015

John Jeremy

Following the decommissioning of the troop transport HMAS *Sydney* in the early 1970s, the eight RAN heavy landing craft (LCH), completed between 1971 and 1974, were the only amphibious transport capability available to the Australian Defence Force. In 1975 the Cabinet approved the construction of an amphibious heavy-lift ship (LSH) based on the British *Sir Bedivere* type of landing ship logistic (LSL), six of which were completed between 1964 and 1968.

Tenders were called from Australian shipyards in September 1976 for the LSH, to be named HMAS *Tobruk*, and a contract was signed with Carrington Slipways at Tomago in New South Wales for the construction of the ship for $36 million (at 1977 prices) for delivery on 21 June 1980.

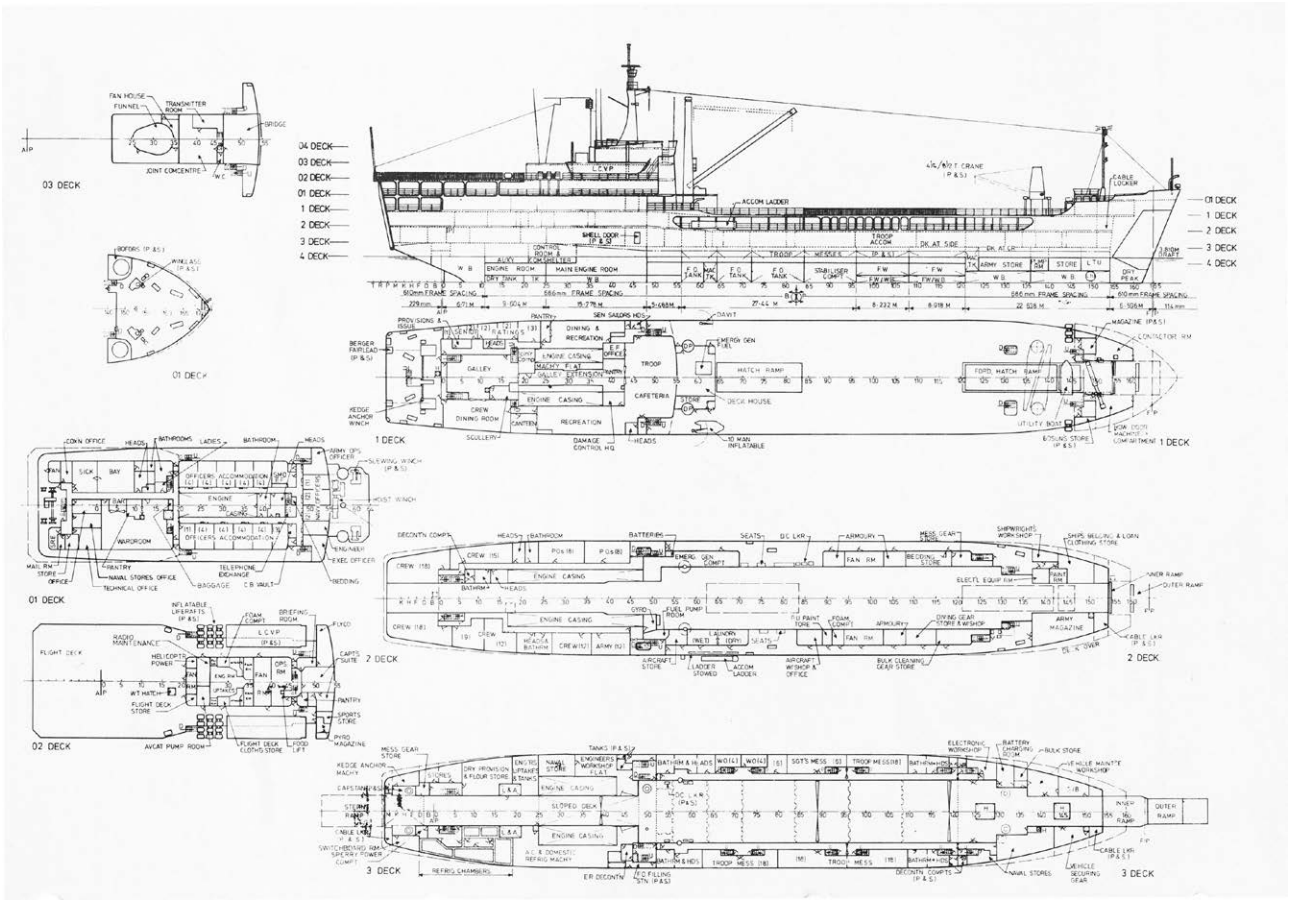
The British LSL had been designed in the early 1960s under the direction of the UK Department of Transport and, when completed, they were operated by commercial companies under charter. They later became part of the Royal Fleet Auxiliary. Built to commercial standards, they were not intended to take part in opposed landings but to be able to land troops and vehicles on suitable beaches in the absence of available ports. By 1980 it was recognised that the class needed a major upgrade or replacement, but the ships were to play an important role in the Falklands War of 1982. *Sir Galahad* was lost and a new ship was subsequently built to replace her. *Sir Tristram* was severely damaged but ultimately rebuilt. She is one of two survivors of the class as a stationary training ship in Portland Harbour. The other is *Sir Bedivere* which was sold to Brazil in 2008.

The design of the LSL was extensively modified for RAN service. The original 20 t crane was replaced with a 70 t derrick capable of handling the Army landing craft which were carried on the upper deck, the upper deck was strengthened to enable Chinook helicopters to operate from the ship, the aft flight deck was strengthened and enlarged to accommodate Sea King helicopters, davits were provided for carriage of LCVPs, and the accommodation was improved and enlarged for the substantially-larger RAN crew. There were many other changes, including a different external communications outfit, provision for the fitting of 40 mm Bofors guns and changes to propulsion and auxiliary machinery including an increase in generating capacity from 400 kW to 550 kW. During the detailed design and preparation of working drawings, a further 92 design changes were approved.

The LSLs had been built to imperial dimensions but *Tobruk* was metricated, a change which was to result in an increase in the ship's displacement as the purchase of steel in the original imperial thicknesses would have been prohibitively expensive. *Tobruk* was 297 t overweight when completed, 21.5 t of the increase was attributed to design changes. The displacement increase affected the ship's ability to beach and limited the number of locations in Australia where that was possible.

The construction of *Tobruk* occurred at a time of transition in naval construction contracting, supervision and quality control, and uncertain responsibilities between the shipbuilder, the project, the naval overseers and the stand-by ship's company added to the challenges faced by the

HMAS *Tobruk* under construction at Carrington Slipways, Tomago, in February 1980
(J C Jeremy photograph)



The general arrangement of HMAS *Tobruk*
(Carrington Slipways marketing brochure)

HMAS *Tobruk* entering the water for the first time on 1 March 1980
(J C Jeremy collection)

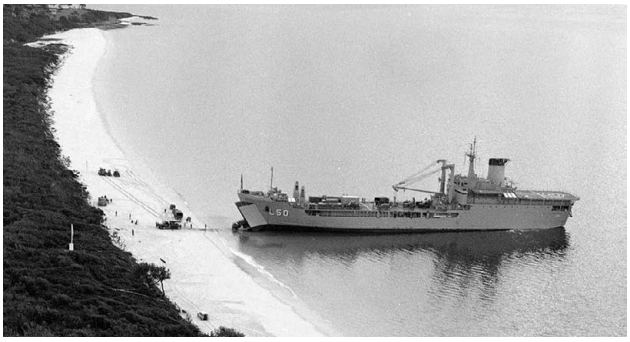
shipbuilder constructing the ship at a fixed price with a demanding schedule. She was the largest ship then built by Carrington Slipways and their first ship for the RAN. The yard was extended and modernised for the task. To help with the very large job of adapting the old British design, a modern computer-aided design system was acquired, the first of its kind in an Australian shipyard.

Cutting of steel began in September 1978 and *Tobruk* was laid down on 7 February 1979. On 1 March 1980 she was named by Lady Cowen, wife of the Governor General, and launched sideways into the new basin at Tomago which had been dredged for the purpose.

Completion of the ship by the original contact delivery date was impossible, and the task of fitting out *Tobruk* was made more difficult by the 1980–81 ACTU-led campaign for a 35 hour working week. On 16 December 1980 *Tobruk* left Tomago under her own power for the tricky journey down the Hunter River to Newcastle Harbour. Sea trials were carried out in early 1981 and *Tobruk* left Tomago for the last time on 7 April 1981. After a final sea trial, *Tobruk* was handed over to the RAN on 11 April 1981, 293 days after the original contract date. She was commissioned on 23 April 1981.

The construction of HMAS *Tobruk* provided further evidence of the challenges involved in modernising an old design to build a ship partly to commercial standards and partly to naval standards, a job made even more difficult by the conflicting responsibilities of the Defence agencies involved in the project. Her final construction cost was $49.4 million, the 37% increase being all due to escalation and modifications, and the final project cost was $59.2 million, a 42% increase on the original estimate.

The first year of *Tobruk's* service was marred by unreliable main engines and serious problems with the sewage-treatment system. The latter was responsible for the tragic death of Sea Cadet Kenneth Dax who was overcome by gas in one of the ship's heads. This event focussed considerable public attention on *Tobruk* as she prepared for a busy operational period, initially in the Sinai and the South West Pacific.



HMAS *Tobruk's* first beaching at Jervis Bay, 4 August 1981
(RAN photograph)

Despite the obvious value of the ship, a lack of enthusiasm for amphibious capability amongst Defence officers in the late 1980s and early 1990s almost resulted in *Tobruk* being sold and replaced, along with HMAS *Jervis Bay*, by the two ex-USN landing ships which became HMAS *Manoora* and HMAS *Kanimbla*. She was reprieved in 1997 when the Australian government decided to retain HMAS *Tobruk* in RAN service until the end of her planned hull life around 2010.

The ship proved so versatile and capable that she survived until 2015. She entered Sydney Harbour for the last time, flying a long paying-off pennant, on 26 June 2015 and was decommissioned on 31 July.

During her 34 years' service, HMAS *Tobruk* travelled about 1 million n miles, spending almost 80 000 hours underway. She visited the Sinai, Somalia, Gallipoli, Kuwait, the United States, countries in South East Asia and many ports in Australia and New Zealand during peace-keeping, disaster-relief work and on major multi-national exercises.

The shipbuilders of Carrington Slipways should be proud of the ship they built for the nation one-third of a century ago.

References

Doolan, K. (2007), *HMAS Tobruk: Warship for Every Crisis*, Grinkle Press, Queanbeyan.

Report 223, *HMAS Tobruk* (1984), Joint Committee of Public Accounts, Parliament of the Commonwealth of Australia.

HMAS *Tobruk* with Army LCM 8s and utility helicopters embarked
(RAN photograph)

Future shipping – today

From battery powered tugs to 100% renewably powered cargo ships, LR is helping to implement future propulsion technologies, today.

Whatever technology or solution you're exploring, we're here to help you assess it, understand it and make it safe.

The LR classed Svitzer Euro, a new generation hybrid tug. It is powered by both diesel and batteries and designed to operate around Barrow Island, a class A nature reserve.

Discover more at www.lr.org/innovation

Lloyd's Register Marine

Working together for a safer world